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Agriculture.

PURE SEEDS.

Complaints are frequently heard concerning the inferiority and non-germinating of farm and market garden seeds. In many cases the fault lies not with the seedsmen who supply such seeds but with the growers, owing to their loose carelessness, or ignorance, of the conditions under which alone certain seeds will germinate with resulting good crops. The Department of Agriculture, since the year 1915, has undertaken the testing of all agricultural seeds, under the Pure Seeds Acts of 1913 and 1914, by a qualified expert in the important work. It had been noticed by the latter officer, when seed-testing operations were commenced, that considerable quantities of oversea lucerne seed were landed in Australia and appeared on the local markets as Hunter River seed (New South Wales), which was sold at a large profit. It is stated in the Annual Report of the Department for 1918-1919 that this happened in 1916-1917; and, although attention was drawn to the practice, and particularly to the danger of the importation of weeds such as Hexham Scent which are against the interests of dairy farmers, the practice still continues; and of eighty-five samples of lucerne seed examined last year, twenty-one were of South African origin, and probably each lot represented a ton or more of seed.

The Regulations under the Pure Seeds Acts require all seeds classed as low grade to be distinctly marked as such, with the germination per cent. clearly and indelibly branded on the bags; all invoices and labels must also give the percentage of germination with date of test. This is most important to both buyer and seller, who should thus be able to fix a value in accordance with the percentage of growth. In the buying of both Rhodes and Paspalum, the price per pound of the seed has no relation to its value unless based on the percentage of germination.

Out of the 112 samples of Rhodes Grass seed tested during the year, only 15 were up to the prescribed standard of 40 per cent. germination; the average growth of these samples being 43 per cent.

The prescribed minimum for low grade is 20 per cent.; and 53 samples with an average growth of 25.8 per cent. were so classed. The remaining 44 samples did not comply with the Acts on account of germination or impurities.

Paspalum is one of the most difficult seeds to test, and, in the past, has caused much disappointment by the failure of seed of good appearance to make a stand.

As an outcome of these complaints, several prosecutions were instituted about a year since; and the Department is pleased to be able to report that the seed now offered for sale is of much better quality.

America is a large buyer of both Rhodes Grass and Canary Seed; and it is recommended that our merchants would do well to get into direct communication with the United States.

At present large quantities are sent each year to Sydney. Most of this is shipped, after bearing cost of freight and merchants' profits, which should be kept, if possible, within our own State.

During the past season several complaints have been made as to the quality of the oats offered for sale.

These, in nearly every instance, were purchased in the South by produce merchants, in order to supply the demand for a cheap line of oats. Farmers seldom bother to ask for seed oats, the price being, in most instances, the deciding factor, not quality. Unless buyers distinctly ask for seed, little can be done for the protection of their interests. Three lots of oats offered for sale as seed were found to contain, respectively, 10.499 per cent., 18.15 per cent., and 19.752 per cent. of weed seeds. In each instance proceedings were instituted with success.

It is satisfactory to learn that both seed merchants and farmers are now availing themselves of the Seed Laboratory for the identification of weed seeds. During the past year over 40 lots were sent in to be named, amongst them being Hexham Scent, Oriental Rocket, Giant Brome, Dodder, Dock, and many others found in seeds offered for sale as seeds for sowing.

The more general use of seed-cleaning machinery would remove most of them; and farmers would do well to purchase only from those who clean and grade their seeds.

The subjoined tables will serve to show the important work in seed-testing carried out by the Department:—

AGRICULTURAL SEEDS TESTED UNDER THE PURE SEEDS ACTS OF 1913, 1914, 1915, 1919.

Number of Samples Tested.	Year.	Number of Samples Tested and Found—		Number of Samples Condemned on Account of—	
		Standard.	Low Grade.	Impurities.	Germination.
301	1915	162	29	35	75
759	1916	505	152	11	91
706	1917	487	124	6	89
760	1918	472	145	29	114
817	1919*	489	170	36	122
3,343	Totals	2,115	620	117	491
In Percentage ..		63·3	18·5	3·5	14·7

* Six months to 30th June.

VEGETABLE SEEDS TESTED UNDER THE PURE SEEDS ACTS OF 1913, 1914, 1915, 1919.

Number of Samples Tested.	Year.	Number of Samples Tested and Found—		Number of Samples Condemned on Account of—	
		Standard.	Low Grade.	Impurities.	Germination.
166	1915	93	18	8	17
236	1916	161	32	2	41
314	1917	200	53	3	58
310	1918	206	58	3	43
528	1919*	436	60	2	30
1,554		1,096	221	18	219
		70·5	14·2	1·2	14·1

* Six months to 30th June.

POSSIBILITIES OF FLAX.

There are several lucrative crops grown in Europe and in other parts of the world which may be easily and advantageously grown in various parts of Queensland, according to the climatic requirements of each. Amongst such crops, flax takes, or should take, a prominent place. On this subject we have, in previous issues of the Journal, published several articles dealing with the whole industry from seed time to harvest; and we particularly draw attention to the article on "Flax and Linseed," which appeared in the issue of the "Queensland Agricultural Journal" for September, 1918. Further articles will be found in the numbers for June, July, September, October, and November, 1919. Our readers will find valuable food for thought in the following letter, which appeared in a late issue of the "Brisbane Courier," by Mr. R. F. Strachan, Craigee, Goondiwindi:—

"I was greatly interested in the article 'Flax Crop' appearing in your issue of the 15th instant. Being one of the first to experiment in the growing of flax for fibre and seed (linseed) in New South Wales (I obtained first prize and certificate at Royal Agricultural Show, Sydney, 1905, for an exhibit of flax straw—retted—flax fibre, and linseed), it has occurred to me that the public might be interested in learning some additional facts concerning flax-growing and its possibilities.

"As indicating the range and extent of the cultivation of the flax plant—prior to the war—Russia put under crop annually 2,600,000 acres; Austria-Hungary, 165,000; Germany, 150,000; Italy, 130,000; Belgium, 76,000; France (variable), 70,000 to 150,000; Holland, 21,000; Ireland, 50,000; Roumania, 63,000; Norway, 5,000. Except in Lincolnshire, little was grown in England. The United States of America usually cropped 1,300,000 acres for seed. Canada is also a producer; and the Argentine's annual output is approximately 33,000,000 bushels of seed. In Egypt the plant has been grown from time immemorial; and India is an immense producer of an inferior class of large seed, mostly used for oil and oilcake—one of the best 'beefmaking' cattle foods known, and if fed to 'milkers' will considerably increase the 'butter-fat.'

"Thus it will be seen that flax accommodates itself to greater vicissitudes of climate and soil than any other economic plant. In 1902, at Urana (Riverina), I planted (side by side) 5 acres of wheat and 5 acres of flax under exactly similar conditions of cultivation. Owing to the drought, both died; but the flax remained green long after the wheat growth had entirely disappeared. This experiment showed the drought-resisting qualities of the plant. On the other hand, owing to the 'oily' nature of the plant, it will stand more rain than any other kind of cereal before shelling-out, and the fibre cannot spoil.

"The supply of flax fibre has never overtaken the demand, and is at present much below requirements. Consequently the price is very high, I understand the Imperial Government, through the Commonwealth Government, is offering up to £160 per ton. At this rate and the enhanced value of the linseed, the approximate return per acre for a good average crop would be about £30 clear of expenses. I have often been asked, 'If there is such a good thing in growing flax, why is it not more exploited?' From my experience and observations, I find that the chief obstacle is the want of a flax mill for extracting the fibre from the 'flax hay.'

"The position is this: We have, on the one hand, an unlimited market for flax fibre, but none on the other for 'flax hay' (*i.e.*, up to the point that any ordinarily intelligent farmer can grow it to). Once create a market for 'flax straw' by the establishment of retting, breaking, and scutching mills to purchase from the farmers the 'flax straw,' and I am confident that the flax-growing industry will rank with our principal products of wheat, wool, &c. Several farmers at Warwick, Clifton, Allora, &c., have put in small areas (2 or 3 acres) this year as an experiment. Unfortunately, owing to the droughty conditions, the seed grown was very attenuated in most cases; consequently the results will be considerably below the average. Owing to the want of a flax mill, the straw, with the exception of a bundle or two sent to the Agricultural Department, will be useless. Had a centrally situated mill been available, the straw could have been marketed, and the average return per acre considerably increased.

"I would suggest a company be formed. An area of, say, 400 or 500 acres be secured in a suitable locality for the growing and preparing of flax. Put in 200 or 300 acres. This would serve as a guide to surrounding farmers, and ensure a sufficient quantity of 'flax straw' to warrant the erection of a small plant to treat same—the same plan as adopted with butter factories. I might suggest that it could be run in conjunction with the butter factories. Having already trespassed at length, I will defer to another week the method of planting, &c., and its results as adopted by me in New South Wales."

THE VALUE OF IRRIGATION.

The Under Secretary for Agriculture has received the following letter from Mr. W. S. Harding, Inspector of Dairies, Esk:—

"The value of irrigation during these periods of drought is well demonstrated on Mr. James Gray's farm (Cobbi), situated on the Brisbane River, about 5 miles from Toogoolawah. Mr. Gray is irrigating about 7 acres of lucerne, from which he is feeding 100 head of stock, consisting of cows, horses, and young stock; he is not only keeping them alive, but in fair condition. I particularly noticed one portion which was watered about three weeks ago. The lucerne was over 3 ft. high, and had a strong, vigorous growth. The system used is spraying; and as one section of the paddock is cut through it gets a fresh watering of between 1½ to 2 in. of water. A 12-horse power oil engine is used to pump the water from the river; a 6-in. main carries it across the paddock; then 3-in. branches distribute it through the sprays. The pump used is estimated to lift 11,350 gallons per hour; Mr. Gray estimates to water 1½ acres in about twelve hours. When I called he was busy watering 3 acres of maize which was just above ground.

"Mr. S. H. Hosking has just installed another plant on the adjoining farm (Baccing Plain). He has watered about 4 acres of lucerne which appeared to be almost dead when irrigation was commenced, which was just about a week before I was on the farm. The results were marvellous. In some places the crop was quite 1 ft. high and making vigorous growth. These results go to prove beyond doubt the suitability of the Brisbane River water for irrigation purposes. I omitted to mention that the power Mr. Hosking is using is from a 16-horse power tractor, which he intends using for field work, ploughing, &c.

"Whilst visiting the Kilcoy district last month, I saw a small plot of lucerne which Mr. J. J. Webb had irrigated with a small plant throwing about 2,000 gallons per hour, the water being flooded on to the crop, which was looking splendid, and, although having only about a fortnight's growth, was fit to cut for green feed. Mr. Webb was also busy watering about 3 acres of maize intended for cow feed. He has a small concrete silo, which was filled last season with maize stalks and other green fodder. This has helped him to keep his cows going through this dry weather."

To the preceding letter from Mr. Harding on this subject, we append the following notes:—

When we consider that the importance of and the necessity for irrigation were recognised more than 2,000 years before the Christian era,* we can but marvel that in the twentieth century men are content to depend upon the uncertain rainfall to sow, cultivate, and harvest their crops. In this country there are many thousands of acres lying idle and worthless so far as the needs of civilisation are concerned, which have yet to be won to remunerative agriculture by judicious irrigation and drainage. The rainfalls in many districts are so capricious—the amount of water needed to produce heavy crops so great—the difficulties in the way of making our soils retain enough of the cloud water which falls to meet the demands are so many—that it must be plain to every practical man and student of agriculture who has devoted much thought to the subject that the time must come—has come in many cases—when the waters now running to the sea, with their tons of unused fertilising matter, will be turned to use in irrigating large tracts of the country over and under which they flow.

If 12,000,000 acres of the barren sand of the Sahara Desert in Africa have been rendered fertile by French enterprise, and many more millions by British irrigation works in the same country, notwithstanding the absence of fresh-water rivers and lakes, what could not be achieved in our richly-endowed State—richly endowed with large tracts of fertile lands, with numerous rivers flowing full during wet seasons to the Gulf of Carpentaria in the North, to the Murray in the South, and to the Pacific Ocean along the extended coast line of Queensland? The one thing needful, after population, to make this State the greatest Agricultural Producer of the Commonwealth is that priceless boon—water. Although we have numerous rivers, yet many of them are but rivers in name; for in dry seasons they cease to flow, becoming either mere sand beds, or showing at best a chain of stagnant waterholes. Here, then, it is that the capitalist and the engineer have such an ample field before them in the way of conserving the vast bodies of water which periodically flood the country and are, as we have said, borne away to the sea, leaving the rivers to gradually dry up and once more resume their normal state.

Have we the men and money to lead the way in this vital matter?

There are many enlightened agriculturists, pastoralists, fruitgrowers, and others—some possessed of capital, others devoid of means—in Queensland who have taken the matter in hand, and who have, by perseverance, solved the problem of water conservation and proved how our lands can be saved from aridity. For years, in this rich State of Queensland, graziers have again and again struggled against devastating droughts surpassing the present ruinous drought. Depending as they did—and, in many cases, as they unfortunately still do—for the existence of their flocks and herds on an uncertain rainfall, they have, from time to time, suffered the partial or often the total loss of the results of their long years of labour and self-denial. When water failed, the grass and herbs disappeared, and with these large numbers of sheep and cattle also disappeared.

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* Virgil, in the Georgics II., advocates irrigation; he died in the year 19 B.C.

The sole resource of the Western pastoralists for a water supply consisted of dams excavated on the plains or on the banks of rivers, or of wells sunk here and there where water could be obtained at shallow depths. When these dried up under the influence of the sun, of scorching winds, or of long-continued droughts, then ruin stared in the face of the man on the land. An idea was generally entertained that irrigating is an operation attended with such great expense that it could be undertaken only by syndicates or capitalists, and that, therefore, the small farmer could never hope to derive benefit from any exertions he might put forth in the direction of making himself independent of cloud water, so very uncertain and capricious in a country devoid of high mountain ranges in the interior.

Nothing could be more contrary to fact. It has conclusively been found in this State that it is the smaller cultivators who derive the greatest benefits from irrigation; and for the reason that irrigation demands intense and deep culivation, that farms need not necessarily be large, that for this reason a larger population is enabled to settle on a smaller area, and that there will be more homes and more comfort and a greater enjoyment of the blessings of life for men of small means. The appliances and concomitant of a higher civilisation—of a higher condition of comfort of living, and of morality—naturally follow on a condition of closer settlement; so that this simple matter of irrigation presents such vast possibilities and potentialities as can scarcely be grasped by any but those who have had practical acquaintance with the social and moral conditions of rural communities where irrigation is the rule and not the exception. To sum up:—Consider what irrigation does for us. It enables us to cultivate to a profit the arid soils of the West, especially where railway communication connects with the Coast. It makes the desert literally to blossom. It makes paying crops a certainty. It multiplies the productiveness and carrying capacity of the land. It renders the farmer perfectly independent of rainfall. It enables the orchardist and vigneron to produce the choicest fruits to perfection, and, even where there is a good rainfall, it increases threefold the value of the land in such districts.

If the dwellers in Australia alone knew what vast areas of fertile land—what inexhaustible stores of artesian water—what facilities for carriage of produce exist in the Central district alone—and what heavy crops of cereals and fruits are there produced by irrigation—the so-called Desert and Downs Country of that part of Queensland would be laid under cultivation from Emerald to Longreach and Barcaldine by hard-working home-seekers, by farmers who understand their business, by men who know that success as certainly succeeds labour in such irrigation areas as night succeeds day. It is only of recent years that, here and there, practical provision has been made either for the storage of water or for obtaining a regular supply for irrigation purposes by means of artesian wells, shallow ''gang'' or ''tube'' wells, and pumping from river and lagoons. True, artesian water has been flowing from several hundred wells in the Western country for many years, and dams have been constructed on almost every cattle and sheep station in the State; but these wells were not intended for any other purpose than that of watering stock. The agriculturist, pastoralist, dairy farmer, &c., all depended alike on an uncertain rainfall for the production of crops and grass.

As giving an idea of the possibilities of agriculture by irrigation in the South-west of the State, I will take the Warrego River. Independently of the bores, there is an opportunity here presented for the storage of vast quantities of water which would amply suffice for the needs of hundreds of wheatgrowers and other agriculturists, if only the Government, or some wealthy capitalists like those of Mildura in the sister State, could be induced to take up the scheme. It is this:—

The winding course of the Warrego, from its sources in the Main Dividing Range beyond Augathella to a point about 8 or 10 miles below Cunnamulla, is about 350 miles; and throughout the whole of this distance there is everywhere as fine soil for wheatgrowing as the most fastidious farmer could wish to put the plough into. Even after the most terrible drought which has ever been recorded since Sturt's time (1902), there were to be seen splendid reaches of deep water at short intervals all along the river's course. As for the river in flood time, it is then really a river, and a grand one throughout. It did not appear to me as if it had much fall, as the water scarcely flowed quickly southward even in the longest reaches. Now, can anything be done to store this water which now goes practically to waste? The answer is, ''Yes,'' and at an outlay small indeed in comparison with the benefits to be derived from the work, both by the State lessee of the land and by the State itself. But a few more words on the waterholes of the Warrego, which may be seen at every few miles. Just below Charleville there is a fine stretch of water. Between that and Dillalah there are two or three, and several between Murdoch and Claverton, and on past Coongoola to far beyond Cunnamulla.

If a 10-ft. overshot dam were erected at Kane's Crossing, 4 miles below Cunnamulla, so level is the land that that single dam would throw water back for over 30 miles. When that water is dammed back, a sand dredge would easily remove the sand which is busy obliterating what, at one time, must have been a deep, noble river. The width of this stream would be about 3 chains, and the depth of water 10 feet. That means that over 1,900,000 gallons would be safely retained in this one locality. A sum of £60,000 to £70,000 would erect head works among the deep valleys at the source of the river, and about ten overshot dams would be needed. These would cost about £3,000 to £4,000 each. Thus the expenditure of £100,000 would retain all the vast volume of water which now goes to waste every year, amounts to, roughly, 10,000,000,000 gallons. Does it not seem the acme of folly, when good rains have come and grass is growing all over the country, to rest content in a fool's paradise, and cry "Safe," when there is no safety from the inevitable recurring droughts?

Although I have singled out the Warrego River as an instance of its value as a basis for irrigation, yet there are many others presenting similar opportunities for their utilisation in like manner—such as the Balonne, the Maranoa, the Moonie, the Condamine, the Bulloo, the Paroo, the Elliott, the Burdekin, and many others.

THE POSSIBILITIES OF IRRIGATION.

Writing from Gatton on the same important subject of Irrigation, Mr. J. J. Carew, Inspector of Dairies, Gatton, brought under the notice of the Under Secretary for Agriculture the following matter, which may serve some useful purpose:—

"Yesterday I called" [28th November], he says, "on Messrs. W. Hood and Sons, Rugby Farm, Gatton, where an irrigation plant was installed some few months ago. On arrival I was shown the various crops—lucerne, potatoes, onions, vegetables—and also the irrigation plant. The lucerne paddock, 30 acres, half of which was harvested during the week, yielded from 15 cwt. to 1 ton of trussed hay per acre, which realised the high price of £18 10s. per ton in the open market. The remaining half, to be harvested during the next few days, is a three-weeks' growth and stands from 18 to 24 in. in height.

"Potatoes, 2 to 2½ acres, which were being sprayed on my arrival, are now in the flowering stage and carrying, apparently, a full complement of young tubers the size of hens' eggs. Merchants already are negotiating with Mr. Hood for the purchase of the whole crop, which is the healthiest and most promising plot of potatoes I have seen for years.

"Of the onions there are about 6 acres now being dug and prepared for market. They are mostly of the Hunter River Spanish variety, medium to large size, and apparently of first quality. A yield of 5 tons of marketable onions per acre is anticipated.

"Messrs. Hood and Sons have made it possible—through the judicious use of the water pumped from the Lockyer Creek, and carried over the farm through pipes fitted with spray taps at regular intervals, and coupled in such a way as to make it convenient to disconnect and remove the pipes whenever necessary—to not only grow a sufficiency of green feed for their stock and keep the market well supplied with various kinds of vegetables, but are also in a position to put fodder and other crops on the open market, where they are now reaping the harvest such men richly deserve for the excellent example they have set to others."

COTTON-GROWING IN AUSTRALIA: REVIVAL OF INTEREST.

Introductory.—Every effort is now being made in Queensland to revive interest in the cotton-growing industry. From a variety of causes, which it is not necessary to traverse in detail, the industry has had its ups and downs, and although, as a rule, the acreage has remained small, authorities on sub-tropical agriculture feel confident that not only in this State, but in other portions of the Commonwealth, cotton-growing is capable of considerable extension upon a commercial basis.

As far back as 1858 the establishment of the industry was strongly advocated by Dr. Lang, who had made successful attempts to cultivate cotton in New South Wales. In 1861, upon the outbreak of civil war in North America, prices rose to a high figure, and Queensland was able to supply relatively large quantities of the world's requirements. Prices, however, fell rapidly at the conclusion of the war, and Queensland's activities dwindled in consequence. The early eighties saw a renewal of effort, which was marked by the formation of the Ipswich Cotton Company and the manufacture in Australia of cotton goods. The mill eventually passed into the hands of Joyce Brothers. The industry, however, again declined, but was carried on in a small way by a few growers. In 1902, when Australia was in the grip of a particularly bad drought, the Queensland Government, through the Department of Agriculture, in order to encourage the cultivation of cotton, not only for the lint, but also as a fodder crop for emergency purposes, undertook to supply seed, receive the crop, gin and sell it on the owners' account, and to make an advance when the raw cotton was received into the store. The acreage again began to extend. As the result of war conditions, the net return to the grower has been as much as 4d. per lb., which, on a yield of 1,000 lb. per acre, is equivalent to nearly £17 per acre.

The principal economic consideration was, of course, the price obtainable. There was, however, another aspect which is important and interesting. In the early days a great proportion of the seed which was cultivated was of the Sea Island cotton, but recently Upland American cotton was introduced, and produces almost the whole of the lint placed on the market. It is regarded as excellent in quality. Suitability of varieties must be determined before permanent and satisfactory progress can be made.

In its present campaign, the Queensland Department of Agriculture does not favour a return to the plantation or large area system, and strongly urges the cultivation of a few acres on a farm as a subsidiary crop. Its reason for so doing is twofold. In the first place, the kanaka labour that was available in the plantation period is not now to be obtained; and, in the second place, a grower can handle, say, 10 or 12 acres without recourse to additional and temporary assistance. Later, if the cultivation of cotton becomes an established industry, the areas would naturally be enlarged in proportion to the profits derived.

Special Committee's Report.—When the possible re-establishment of the industry came to be considered, the Queensland Committee of the Institute of Science and Industry displayed an active interest in the question, and upon its recommendation the Executive Committee of the Advisory Council appointed the following gentlemen to report upon the matter:—Messrs. J. B. Henderson, E. G. Scriven (Under Secretary, Department of Agriculture), N. Bell, D. Jones, and Professor B. D. Steele. Prior to this the Institute had interested itself in one or two phases of the industry, such as the perfection of a mechanical cotton-picker and the investigation of varieties. Immediately upon its formation, the Cotton-growing Committee made a careful survey of all available evidence, and submitted the following statement to the Executive:—

The causes of the past failures are many and complicated—different causes appearing to preponderate on different occasions. Amongst the adverse conditions that have operated, the following may be mentioned:—

(1) Cost of transport to the world's markets during periods of low price.

(2) Lack of local market which would absorb the crops during such period.

(3) Competition with other crops believed at the time to be more profitable, accentuated by the smallness of the agricultural population in Queensland.

(4) The cultivation of unsuitable varieties of cotton.

Plants of the cotton family are indigenous to Queensland, and it might, therefore, be expected that such plants would thrive in this climate. The experience of the past sixty years confirms this expectation, and from all the evidence available it may be taken as established that in a great number of districts in this State climate and soil are entirely favourable to the production of good crops of cotton of excellent quality. Moreover, the cotton appears to be more resistant to drought than certain of the local staple crops, such as potatoes and maize. It has proved also a good reserve in drought as a stock fodder.

It becomes necessary, therefore, to ascertain whether the causes to which the former failures are to be attributed are still operative.

Considering first the question of growing for export, it is clear that Australia labours permanently under the dual disadvantages of distance and of competition with other countries where abundant cheap labour is available. It is, however, quite possible that the growing of a long-staple variety suitable for export may enable these disadvantages to be successfully overcome.

Looking at the matter from the point of view of the local market, the possible outlets for raw cotton are—

(1) The manufacture of nitro-cotton by the Commonwealth Explosive Factory. This offers an immediate demand for a limited quantity of cotton. The annual demand of the factory is about 50 tons.

(2) The manufacture of mixed cotton and woollen goods. This outlet is also limited, but in 1916 and 1917 a total of 282 tons of cotton was imported from the East for this purpose, in addition to 25 tons of Queensland cotton sold in Australia for that purpose.

(3) The prospective manufacture of cotton goods in Australia. That is, as indicated, prospective; and past experience at Ipswich leads us to the conclusion that its development will depend largely on fiscal policy pursued by the Commonwealth Government.

The utilisation of the cotton seed by the manufacture of cotton-seed oil and other by-products will yield further returns, and must be taken into account.

We are of the opinion that the present consumption of raw cotton in Australia is sufficient to give the cotton industry every opportunity of becoming established as a staple primary industry. If this opinion is correct, it becomes necessary to consider what will be the best methods to adopt to encourage its development.

We consider it necessary—

(1) To take every possible precaution to prevent the introduction from America or elsewhere of the various cotton pests. With this object in view, all imported seed should be propagated in quarantine before distribution.

(2) To ascertain the most suitable varieties of cotton to meet—
    (*a*) The requirements of Australian consumers;
    (*b*) The climatic and soil conditions of the districts in which cotton can be grown with advantage;
    (*c*) The possibility of using the mechanical picker.

(3) To encourage farmers to grow each a few acres of cotton as an auxiliary crop, rather than prematurely to reintroduce the plantation system.

This mode of procedure is advisable as presenting the dual advantages that the farmer is not at the mercy of a possible failure of a new type of crop, and that a crop of a few acres could be picked by a family of average size without employment of casual labour.

We would suggest that the following methods of encouragement might be adopted:—
    (*a*) Propaganda with issue of suitable bulletins.
    (*b*) A continuation of the State Department of Agriculture's system of ginning and marketing on owners' account.
    (*c*) A guarantee by the Commonwealth Government for five years of an amount certified to by the State Department of Agriculture that will enable the grower to receive 4d. per lb. for seed cotton on the farm.

(4) To stimulate similar development of the industry in States other than Queensland on the grounds that the larger the production of raw material the more likelihood there will be of the establishment of factories for the manufacture of cotton goods. Once these are fairly established, the stimulus between the primary and secondary industries will be mutual.

(5) To continue experiments that have been started aiming at the production of a cheap and efficient form of mechanical cotton picker.

From such information as is available, this Committee concludes that sufficient protection will be afforded without the imposition of any Customs duty. Stringent quarantine regulations must be prescribed and rigidly enforced.

To assist in doing this, we recommend that a limited number of ports of entry be prescribed, and that adequate fumigation chambers and plant be installed at each of these ports. By this means the introduction of pests will be prevented, and, at the same time, the cost of fumigation, which should be paid by the importer, will afford appreciable and adequate protection to the growers.

The Committee consider it absolutely essential, if the introduction of pests is to be prevented, that this fumigation should be established apart from any question of protection. As kapoc is imported from the East in quantities, it is considered essential that it should also be fumigated on importation.

(NOTE.—It has been reported to us that soldiers and others are introducing small quantities of cotton seed into the country, chiefly from Egypt. There is grave danger of the introduction of Pink Boll Worm and other pests into the country by this means.)

Any attempt to encourage the growth of cotton in Australia should have as its ultimate aim the establishment of a cotton manufacturing industry in the country. Past experience at Ipswich teaches us that such an industry cannot flourish without some measure of protection. As soon as the production of cotton has reached the stage where it can more than satisfy the requirements of the present consumers of raw cotton in Australia, the question of the imposition of a duty on manufactured goods and the amount of protection needed will become an urgent one.

In the meantime, it is the duty of the growers to demonstrate that they can profitably meet all present requirements.

Action taken by the Institute.—The Executive Committee has for some time been of the opinion that the most hopeful method of solving the labour problem is by the introduction of a mechanical picker, which would obviate the necessity of hand-picking. Inquiries were consequently made from numerous sources in the United States, and a good deal of information was obtained on the subject. As the result of a number of laboratory experiments, a machine has been devised, and is now being constructed, which it is considered will survive all practical tests, and fulfil the requirements for which it is intended. There is a limit, however, to the powers of this machine, or, indeed, of any type of mechanical cotton-picker, inasmuch as tractable varieties alone of cotton can be picked. Mr. Daniel Jones considers that the tractable type can be grown at the same value as the intractable type, and that the quality is merely a question of cultivation and seed. To this end, therefore, he has secured certain varieties from various places in Queensland, and they are being cultivated near Brisbane. A practical test of the picker should, therefore, be possible during the next autumn.

In addition to the seed already introduced into Queensland, the Institute has made arrangements for the importation of seed from the United States. The request sent to the Bureau of Agriculture was for the high commercial varieties grown in localities whose climate is similar to that of Queensland, and steps have been taken to have all imported seed thoroughly fumigated to prevent the introduction of pests. Upon its arrival the seed will be treated at the Department of Agriculture, Brisbane, and will be grown under the supervision of officers of that Department.

In view of the recommendations of the Queensland Committee, the Executive Committee gave close consideration to the question of a guaranteed price for a number of years. The conclusion arrived at was that the Commonwealth Government should be recommended to guarantee the grower 4d. per lb. for seed cotton for the crop to be harvested in 1920, and the price for succeeding years to be adjusted according to the world's price and to local requirements. At the present time the Liverpool price for ginned cotton is 1s. 6d. per lb., and, as it takes 3 lb. of cotton in the seed to make 1 lb. of ginned cotton, it was considered that the price agreed upon, while offering profitable returns to the grower, would not commit the Government to any great financial risk.*

It is officially estimated that an average crop of cotton in Queensland should produce 1,000 lb. per acre, which would represent, at 4d. per lb., a gross return of £16 13s. 4d. per acre. Allowing £5 per acre for working expenses (planting and cultivation £2, and harvesting £3), the net return would be £11 13s. 4d. With the prospect of securing such prices, the Department of Agriculture anticipates a considerable extension of the acreage for this year, and a general stimulation of the industry.—"Science and Industry."

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* This matter of a guaranteed price of 4d. per lb. to the grower has, in consequence of representations by the Queensland Department of Agriculture, been conceded by the Commonwealth Government. Cotton-growers during the year 1920 are thus assured of a generous fixed price for all seed cotton delivered by them at the State Ginnery. Furthermore, should the price of ginned cotton continue to rise, whatever extra price may be received owing to the very probable conditions obtaining in the export of cotton from the United States, Egypt, and India, any increase in the price of ginned cotton will result in a corresponding increase in the price of the farmers' seed-cotton.—Ed., "Q.A.J."

SOME FODDER GRASSES.

ELEPHANT OR NAPIER GRASS

has received a good deal of notoriety, but from reports published by the New South Wales Department of Agriculture, is in no way superior to other classes of fodder already established, and is certainly not so nutritious as the saccharine Sorghums.

Mr. W. Brotherton, of Gladstone, some three years ago, advertised seed and sets for disposal; but, so far as can be ascertained, this forage plant has not displaced other well-known fodders in that district.

Elephant Grass may be propagated in a similar manner to Cow Cane—*i.e.*, by "sets"; but, from reports, it is inferior to either Indian Cow or 90 Stalk Cow Cane.

SOUDAN GRASS

is one of the latest and is fast becoming the most popular of all the Sorghum family. It stools rapidly, is of quick growth, adapted to most soils, and is capable of reaching a height of from 6 to 7 ft. in as many weeks where conditions are favourable. The stalk is fine in texture, and carries a heavy growth of succulent leaves; particularly adapted for silage and hay purposes; although, when intended for the latter purpose, a slightly heavier seeding is necessary. Under ordinary conditions, 2½ lb. to 3 lb. per acre are ample, sown thinly along drills spaced 2½ ft. apart. Interrow cultivation is necessary in the early stages of the plant's growth; but, as the rows are rapidly overgrown, weed growths are naturally deterred. Soudan Grass ratoons rapidly after cutting. Being a member of the Sorghum family, the usual precautions are necessarily adopted when feeding green to stock—*i.e.*, the plant must be in the flowering stage prior to feeding.

SORGHUMS

are divided into two families—*i.e.*, Saccharine or non-Saccharine. Examples of the former are—*Sorghum saccharatum*, Early Amber cane, Imphee or Planter's Friend, Orange cane, Saccaline; of the latter—Standard Milo, Feterita, Shantum, Dwarf Milo, Cream Milo, Valley Kooliang, Black Hull Kafir, White Kafir, Red Kafir.

Saccharine Sorghums are noted for their nutritious feeding values, but do not carry the profusion of fibrous leaf which marks the non-saccharine family; but, on the other hand, the stalk is juicy and succulent, whilst that of the non-saccharine is woody and fibrous, and practically has little value for stock-feeding purposes. Sorghums do well on most soils, but will thrive where maize would fail, and are, when compared with the latter, more able to withstand dry periods during their growth. Some of the Saccharine varieties—*i.e.*, Imphee—ratoon well in favourable seasons; and this variety withstands frost better than any other known variety; 5 to 7 lb. per acre are necessary when sown in drills from 2½ to 3 ft. apart.

Interrow cultivation is necessary to keep down all forms of weed growths.

Owing to the prevalence of hydrocyanic acid in the early period of its growth, the plant should be allowed to reach its inflorescence stage before feeding to stock in green form.

GUINEA GRASS

is a tropical-growing grass belonging to the Panicum family; stools 2 ft. in diameter being of common occurrence where conditions of heat and moisture are favourable; is propagated from rootlets—seed being difficult to save, owing to its unequal ripening; is more suited to coastal conditions than that of the drier interior; would under favourable conditions form a fair class of rough hay; but is somewhat difficult to harvest successfully, owing to the succulence of its leaves.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1919.

A big drop in the number of eggs laid has been the result of the excessively hot month of November. The condition of the birds enabled them to withstand the severe conditions. There was one death, E. F. Dennis losing his A bird, which had been giving such remarkably good results, the cause of death being inflammation of the bowels. The excessive water-drinking during the very hot days did not cause the trouble one would expect; in fact, the birds look bright. R. Burn's D bird broke a fine run of 81 eggs on the 22nd of the month. E. M. Larsen's C broke on the 20th, after laying fifty-five days in succession. Broodies have been very plentiful, there being in some cases only one bird left in the pen. The light breeds also have given trouble in this direction. The following are the individual records:—

Competitors.	Breed.	Nov.	Total.
	LIGHT BREEDS.		
*J. M. Manson	White Leghorns ...	161	1,104
*T. Fanning	Do.	146	1,082
*W. Hindes	Do.	126	1,038
*E. A. Smith	Do.	140	1,016
*Dixie Egg Plant	Do.	102	989
*Dr. E. C. Jennings	Do.	131	977
*G. W. Hindes	Do.	117	949
*Haden Poultry Farm	Do.	120	948
*Range Poultry Farm	Do.	125	938
*Quinn's Post Poultry Farm	Do.	125	937
*B. Caswell	Do.	139	925
*W. Becker	Do.	135	909
J. H. Jones (Toowoomba)	Do.	127	908
*L. G. Innes	Do.	141	908
*C. P. Buchanan	Do.	129	901
S. McPherson	Do.	109	888
*H. Fraser	Do.	120	886
*J. J. Davies	Do.	129	867
*Mrs. L. F. Anderson	Do.	122	859
G. Williams	Do.	106	854
W. A. Wilson	White Leghorns ...	124	851
G. J. Byrnes	Do.	103	844
*Mrs. A. G. Kurth	Do.	128	835
*W. Lyell	Do.	118	833
S. W. Rooney	Do.	102	825
*Thos. Taylor	Do.	115	824
*Mrs. R. Hunter	Do.	119	802
H. A. Jones (Orallo)	Do.	81	800
Geo. Trapp	Do.	124	796
G. H. Kettle	Do.	108	776
B. Chester	Do.	110	769
*O. W. J. Whitman	Do.	125	756
Mrs. N. Charteris	Do.	116	750
C. A. Goos	Do.	114	744
H. O. Jones (Blackstone)	Do.	108	733
N. A. Singer	Do.	99	725
J. W. Newton	Do.	119	720
Oakleigh Poultry Farm	Do.	100	720
R. C. J. Turner	Do.	115	687
W. Morrissey	Do.	99	664
J. H. Dunbar	Anconas	99	652

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Nov.	Total.
	HEAVY BREEDS.		
*R. Holmes	Black Orpingtons ...	132	1,140
*E. F. Dennis	Do.	139	1,075
*R. Burns	Do.	131	1,057
*E. M. Larsen	Do.	122	1,051
*W. Smith	Do.	114	993
*A. E. Walters	Do.	103	972
Geo. Nutt	Do.	97	957
*Kelvin Poultry Farm	Plymouth Rocks ...	106	942
*E. Morris	Black Orpingtons ...	115	932
*A. Shanks	Do.	86	923
*Nobby Poultry Farm	Do.	105	910
*T. Hindley	Do.	118	870
*Jas. Ferguson	Chinese Langshans ...	102	847
*Mars Poultry Farm	Black Orpingtons ..	115	846
*D. Fulton...	Do.	83	837
*W. H. Reilly	Chinese Langshans ...	91	810
R. B. Sparrow	Black Orpingtons ..	136	808
Burleigh Pens	Do.	104	776
A. Homan	Do.	123	769
*F. W. Leney	Do.	99	759
*H. Puff	Rhode Island Reds ...	68	754
J. A. Cornwell	Black Orpingtons ...	116	702
*T. B. Barber	Do.	68	699
C. H. Singer	Do.	96	675
H. Ashworth	Do.	111	660
A. Gaydon	Do.	90	642
Total	...	7,635	57,395

* Indicates that the pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
			LIGHT BREEDS.				
J. M. Manson	189	174	192	185	180	184	1,104
T. Fanning	188	164	177	189	175	189	1,082
W. Hindes	187	178	172	157	172	172	1,038
E. A. Smith	169	163	186	167	156	178	1,016
Dixie Egg Plant	150	164	176	179	153	167	989
Dr. E. C. Jennings	167	140	167	158	159	186	977
G. W. Hindes	171	156	170	150	142	160	949
Haden Poultry Farm	175	174	165	154	126	154	948
Range Poultry Farm	138	162	175	168	139	156	938
Quinn's Post Poultry Farm ..	149	159	165	177	145	142	937
B. Caswell	130	99	153	185	197	161	925
W. Becker	181	159	172	141	108	148	909
L. G. Innes	129	173	129	162	169	146	908
C. P. Buchanan	134	174	136	143	147	167	901
H. Fraser	124	163	172	153	114	160	886
J. J. Davies	132	140	153	156	142	144	867
Mrs. L. Anderson	155	166	129	142	127	140	859
Mrs. A. G. Kurth	173	146	149	137	99	131	835
W. Lyell	129	148	158	130	135	133	833
Thos. Taylor	150	119	118	161	160	116	824
Mrs. R. Hunter	125	121	146	139	135	136	802
O. W. J. Whitman	121	152	118	111	132	122	756

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Holmes	191	193	214	169	220	153	1,140
E. F. Dennis	188	164	191	176	155	201	1,075
R. Burns	185	160	172	222	163	155	1,057
E. M. Larsen	179	182	189	160	181	160	1,051
W. Smith	141	181	168	150	187	166	993
A. E. Walters	171	149	173	158	153	168	972
Kelvin Poultry Farm	202	134	151	133	170	152	942
E. Morris	156	146	169	159	187	115	932
A. Shanks	86	128	188	153	179	189	923
Nobby Poultry Farm	152	132	136	150	168	172	910
T. Hindley	165	158	119	161	125	142	870
Jas. Ferguson	146	188	120	118	139	136	847
Mars Poultry Farm	124	170	175	110	106	161	846
D. Fulton	123	140	146	132	155	141	837
W. H. Reilly	121	115	161	155	115	133	810
F. W. Leney..	94	127	134	179	106	119	759
H. Puff	149	110	131	149	96	119	754
T. B. Barber	109	117	111	113	138	111	699

CUTHBERT POTTS,
Principal.

MARKETING EGGS AND FOWLS.

By R. T. G. CAREY, Beerwah.

The Queensland system of poultry and egg marketing is deplorably bad; also, the absence of such produce on the auction mart as dressed poultry, live capons, poulards, 1 and 2 lb. weight fatted chickens (commonly termed ''broilers''), and other quickly remunerative selling poultry products, leaves the impression that neglect might be the producer's fault, or the buyers may be careless as to how their poultry products are forwarded so long as the fowl or egg requirements are obtained. It may also be that the consumers care little and do not worry much so long as their poultry requisitions are supplied. Thus this threefold personal carelessness is accountable for the very indifferent condition of our poultry products and for the unfavourable prospect of improvement, as their motto reads, ''A fowl's a fowl, an egg's an egg.''

Buyers and visitors to the auction markets witness sales of scrubs, weeds, culls, sick, halt, and maimed specimens which are commonly offered for sale. Those unhealthy and diseased birds cannot be palatable or appetising when prepared for the table; hence the disinclination of the general public to be consumers of poultry flesh; whereas the result of rearing, grading, and feeding those scrubs, culls, and weedy ones into proper condition would be productive of satisfaction and increased consumption.

Auctioneers' patrons will not bid high prices for the poorer qualities, because the birds must generally be fed up to good condition before they can be disposed of to their customers, but will freely bid several pence over and above ruling quotations for any crate of nicely fatted birds.

Many are the errors in forwarding fowls to the markets made by the consignors. How often does a worried ''cocky'' exclaim—''Off to the markets with them devils. What a great nuisance they be, eating their heads off, always in the horses' feed boxes, or troubling the pigs, and scratching grain out of the ploughed fields,'' &c. So he prepares an improvised coop, bundles in old cocks, old hens, young cocks, and pullets of all ages and sizes, because, he says, ''They'll fetch a bob or two apiece,'' then carries them to the railway station, leaving them in the broiling sun, in a ''Calcutta black hole'' of a coop, without water or food to do a 150 miles or more railroad journey in addition to a probable jaunt of 15 miles on a dusty road upon a rickety vehicle to the rail siding. No wonder they don't pay—these poor, weary, hungry, thirsty, and almost suffocated creatures; how could they look prime on market day, when they are so down-hearted after being buffeted and knocked about from cruel handling? Invariably the auctioneer's account sales states: "Crushed some were dead, poor condition, and so forth; therefore, the full benefit of market ruling prices could not be realised for your consignment."

The remedy is, to consider their comfort; place drinking water and feed vessels in their black hole of a coop; allow greater space for each occupant; likewise increase the height of the crate. Then only will the birds' welfare and appearance on sale day appeal to the observant purchaser and command the highest "bid." By neglect of such matters, the sender renders himself liable to be prosecuted by the Society for Prevention of Cruelty to Dumb Animals (birds).

Brand, by a stamp or stencil plate, your name and address, and date of railage on coops or crates before sending, thus gaining the confidence of a brigade of buyers and not suffering your "Waterloo."

Eggs are valuable at any period of the year; but how frequently do cases of them, when opened up for inspection at the salerooms or on grocers' counters, exhibit a begrimed condition; some broken by bad packing, soiled, and nest stained; small and large ones, mixed with ducks', turkeys', and guinea fowls' eggs; some even a couple of weeks old, fertile ones, and containing a decayed or dead germ, and all ungraded. These are but some of the faulty conditions that cause low returns.

The remedy is: Careful grading for shape, size, and colour, packing in egg fillers wherever possible; consigning twice weekly; rubber-stamp them with name, dress, &c. This may be all extra labour; *but it pays.*

NEW-LAID EGGS.

This means day-old egg when marketed; two days old when sold by the grocer; and three days old when used by the consumer. They lose their newness after the third day. Now, new-laid eggs of 2 oz. size, and clean, will always command a premium; but they are a perishable food product, and are liable to rapid deterioration brought about by shrinkage of moisture, rot, or rotted by death of the fertile germ, and contamination by absorption of bad odours; so that when they reach the city and should have been sold as "new-laid," they are found to have an objectionable odour caused by absorbing, through the pores of the shell, the foul odours that happened to be in close proximity while in transit and otherwise.

How essential it is, then, to exercise great care to have them thoroughly clean and well packed, also delivered in attractive packages, thereby establishing a regular trade (as long as the supply holds out) with the best class hotels, cafés, clubs, restaurants, and grocers, who are all willing to pay a premium for a guaranteed article.

FRESH EGGS.

These may be about two weeks old, and generally are from farms—whence, when convenient, they are taken to a country town storekeeper, perhaps traded for merchandise, held by the storekeeper for another few days longer, then hurried to the city mart under unfavourable conditions, such as overheated and packed in strange cases or kerosene boxes, the oily odour of which is emitted from the saturated timber, or the fishy or soapy smells from the timbers of other cases. Eggs absorb those foul odours through the pores of the shell, with the result that domestic cooking eggs are a source of complaint, not being equal in flavour and freshness to eggs, neither stale nor tainted, nor have they the bloom and taste of good fresh eggs.

DOMESTIC COOKING EGGS.

Being used principally for pastry, they could not be put on the table, and certainly would not suit all stomachs. To some folks an egg is simply an egg. "Eggs are eggs," but their flavour differs greatly. Whereas a Game hen's egg could not be relished by a bilious person, yet that person could enjoy a White Leghorn hen's egg. The delicious flavour and great richness of Muscovy ducks' eggs are due to the various foods they eat; yet, while many people cannot eat the Muscovy egg, they are able to appreciate that of the Indian Runner duck. The quality of all eggs may be affected, chiefly by the class of foods fed to the fowls, such as prickly-pear, green grass, sand, camphor laurel berries, tainted meats, or fishy diets; nevertheless, a limitation of those highly odorous foods may not injure their piquancy.

CASE EGGS.

They are those which are collected by hawkers or pedlars whose occupation takes them into the country, visiting farms and bartering merchandise or fruit for eggs. Their devious routes usually take about a week to perform, the eggs being collected on both outgoing and returning trips. Consider what a shaking the first-bought eggs endure. Judge what their condition must be in from shocks and bumps encountered on the journey; likewise, the partial incubation during hot, sultry days, &c.

Farmers collect eggs for the next week's visit of the buyer. How happy they may be when a stolen nest is discovered, with a dozen or so of sun-baked eggs; all go to swell the bulk; small, dirty, brown or white eggs, kept in quarters not suitable for their preservation of freshness.

It is from this source that spring, summer, and autumn supplies glut the markets. However good the intent may be between the pedlar and farmer, the purchaser or consumer must not overlook the fact that EGGS are PERISHABLE. Should one happen to be rotten and break while in transit, the fumes therefrom are rapidly absorbed by the fresher ones. That odour seldom vanishes, and is easily detected.

DIRTY EGGS.

They are a source of contamination, as the glue or coating with which the hen seals the pores of her egg, just before laying, is destroyed by being smeared with foreign material, which allows entrance of bacteria, and those germs enter the pores of the egg, and this smearing soon spoils it. All dirty eggs must be washed, rubbing as little as possible, because the bloom is thus destroyed, leaving only an appearance like a stale egg; a good rule is—use the dirty eggs for home household purposes, rather than to market them and risk the spoiling of the consignment.

Eggs can be classified as "Farmers' Specials," "Special," "Fresh," "Extra Good," &c. Damaged ones are heated eggs in which the embryo has incubated, and subsequently died; shrunken air space, or the air cell has enlarged, and the moisture has evaporated, foretelling age. Small eggs, dirty, watery, blood rings, as well as three rots (black, white, and spotted), make eggs absolutely unfit for food. In marketing, grading for uniform shape, texture of the shell, weight (2 oz. average), and care in packing are leading features which govern the higher values. Avoid mixing wrinkled, cracked, thin-shelled, various shades of hue. Exclude all dirty ones, dented eggs, spotted, musty, blood rings, and rottens from a consignment. By so doing your product gets known among buyers and your labour rewarded.

HATCHING EGGS.

In the cold weather eggs chill quickly, and to prevent this they should be gathered often and kept in an even temperature of 60 or 70 degrees F. If kept for more than five or seven days they should be turned about twice daily. Some say that an egg should be put into an incubator fresh. This is a fallacy. Nature has provided that a hen should lay the batch that she is to brood; therefore, we know that the first egg laid gets cool, warmed, and again cooled by the repeated visitation of the laying hen. How long the egg will keep and still be good depends on care and also on constitutional vitality.

Breeders systematically use hatching eggs that are something less than ten days old. Setting eggs are picked, and should be of perfect egg shape, by which I mean short and round; extremely long, showing ridges or rings, rough, cracked, or any other malformed eggs are unsuitable. It pays to use only the choicest eggs for setting purposes (not a farmer's setting of prickly-pear, grass-fed, dung-heap fed birds), and expect to have standard progeny. Hence the tidal-wave of deterioration of poultry, and the reason why stud breeders of fowls and eggs obtain such high and fancy prices for their stock.

The foregoing was penned not in any sense to hurt any reader's feelings, but to lay bare true facts that happen from day to day in the marketing of our poultry produce.

It is the wise chap who carefully carries out many of the minor details, and who make a success of his enterprise, as in all walks of life a man must be adapted for his trade. All the money lavished to teach a girl the piano will not make her a pianist if the musical adaptability is lacking; likewise, dear poultry friends, the hen, turkey, duck, goose, or the fancy side of poultrydom must have personal adaptability and love of work. If these bumps of individualities are lacking, success may never be within reach of your desire to achieve success.

Poultry husbandry is not altogether a lazy or indolent proposition, being made up of so many little details, which constantly crop up on every side apart from the usual daily routine; and he who attends to every item in a large egg-producing business will ultimately prove successful.

FEATHER PULLING.

By R. T. G. CAREY.

Feather-eating or feather-pulling are twin brothers, and all sorts of theories have from time to time been advanced as to what really constitutes the complaint. Mr. R. T. G. Carey, Pindora Poultry Farm, Beerwah, has forwarded us this remedy, which, no doubt, will interest our poultry readers:—

The true cause of feather-eating or feather-pulling is really lice instead of vice. The discovery was made by the aid of a powerful microscope a few years ago. The Board of Agriculture of Great Britain emphasises the discovery, and has given full assurance that the true cause is *lice*. The leaflet issued by our brothers across the seas reads as follows:—

''Feather-pulling or feather-eating is due to a minute parasite (*Garcopis lævis*) at the roots of the feathers. As these mites live upon and irritate the roots of the feather quills, they are found in the white powdery matter at the quills' base. In relieving the irritation caused by these parasites, the birds frequently pluck out feathers. Hence the acquired habit.''

The remedy is a change of quarters for the birds, with sulphur added to all food to cause moult. Then feed for new feathers. Should the habit, however, be too strong, then off with its head.

ERADICATION OF THE FOWL TICK.

The fowl tick concentrates on chickens, although it will also attack turkeys, geese, ducks, pigeons, ostriches, and guineas, the turkey ranking next to the chicken as a popular host. It wreaks destruction by reducing the vitality and condition of the birds as well as minimising egg production. Fowls raised where ticks are numerous are often stunted in growth. Another source of loss is desertion of the nests by setting hens, caused by annoyance from the ticks. Death often results in the case of heavy infestation, the parasites draining the fowls of blood and also poisoning them with certain secretions.

SOMETIMES IN THOUSANDS.

In some instances the ticks are so hungry and so plentiful that they swarm over the fowls by the thousands. The symptoms are usually weakness in the legs and droopiness of the wings, the chickens being unable to walk or even get up on the roost. The feathers appear ruffled, and there is usually a loss of appetite. The comb may or may not appear pale. Sometimes death occurs a day or so later. Chickens, soon after hatching, are often killed by becoming infested with ticks.

The chicken tick or ''blue bug'' is the bed bug of the fowl family. Usually its presence can be determined by examining the ends of the roosts or pulling up loose pieces of bark or boards about the roosts rather than by examining the fowls themselves. Ordinarily during warm weather the eggs hatch in from ten to fifteen days, while in cool weather the hatching period sometimes exceeds three months. The young ticks have six legs and are greyish in colour; they usually prowl about the roosts, searching for fowl upon which to prey during the night. They crawl up on the legs of the fowls and attach themselves on various parts of the body, especially where the feathers are not very dense. The ticks attach themselves in bunches on the host, and usually are concentrated on the breast, under the wings, and on the thighs and neck. They attach themselves very firmly by their spiny mouth parts and suck blood, usually continuing their blood feast for about a week or ten days. Then, blood gorged, they drop from the fowl and seek a secret hiding place. Four to nine days thereafter the seed ticks shed their skins and acquire an additional pair of legs as well as more size. Henceforward, they work entirely at night, hiding in crannies and crevices during the daytime. Following each of the first three meals of blood the skin is shed, and at the time of the last moult the adult males and females appear. After partaking of another meal of blood, the females are ready to lay eggs, the average production being 500 to 900 eggs a female.

PESTS LIVE FOR YEARS.

The longevity of the fowl tick is remarkable, as some of them have been known to live over two and a-half years without any food, and unquestionably in infested chicken-houses many of them survive longer than this, even when all poultry is excluded.

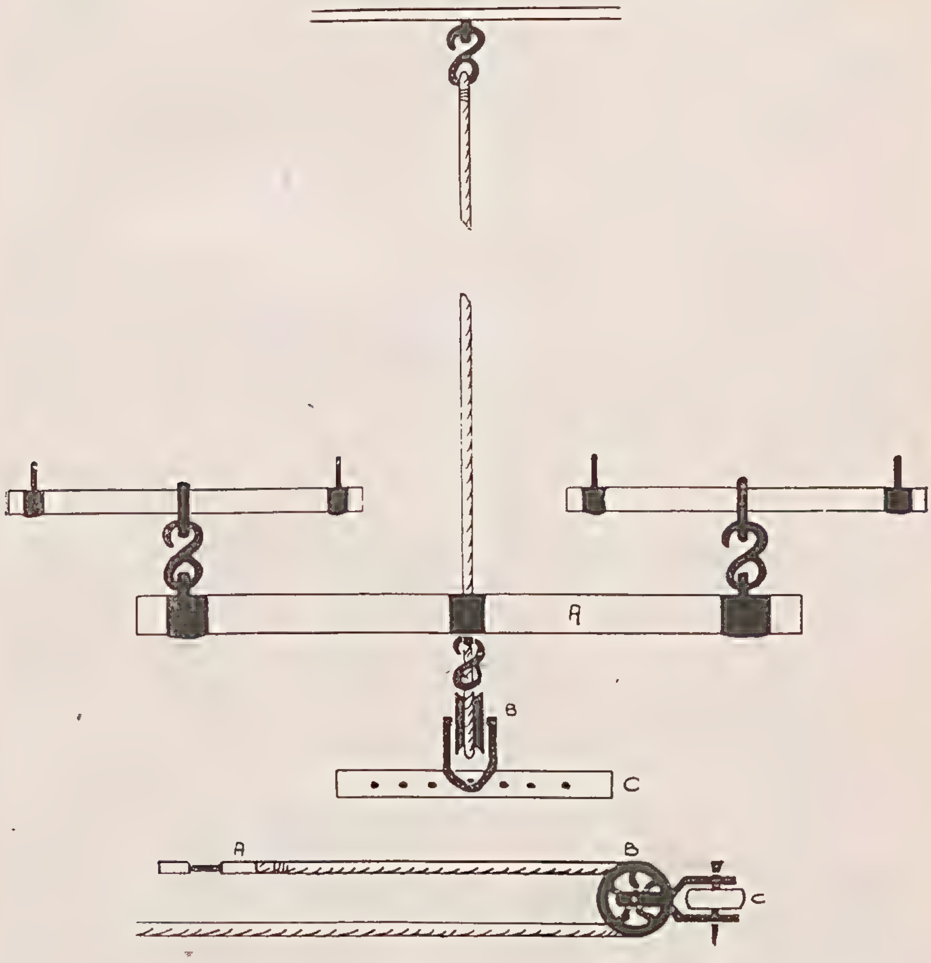
The rapidity of breeding depends largely upon the temperature. Hot dry weather apparently does not interfere with the development of the chicken tick; in fact, it appears to be at home under such conditions.

It is difficult to control fowl ticks by the use of chemicals, although two satisfactory solutions—carbolineum and petroleum—have been found to be effective. Carbolineum is more destructive to ticks than is petroleum. It persists longer and possesses the advantage of drying into the wood so as not to soil the fowls. Anthracene, which is the principal constituent of carbolineum, has been found to be about as effective as the latter material. The limiting factor here, however, is the difficulty of obtaining this material on the market. Creosote oil, containing 8 to 20 per cent. tar acids, is also very destructive to fowl ticks, but is difficult to use in a spray, owing to its caustic effects on the operator. When applied to the roosts and crevices with a brush, it destroys all ticks touched and persists well.

In eradicating ticks it is essential to destroy by fire all the infested material and other equipment which are not valuable.—"Weekly News Letter" of the Department of Agriculture, U.S.A.

TANDEM HITCH FOR TEAMS.

The accompanying sketch will show how the connection is made between the trace chains and swingle bars in the "Tandem Hitch for Teams," illustrated in the November issue of the "Journal":—



Horticulture.

THE GERBERA.

The following paper, by Mrs. Grenning, was read at the November Show of the Horticultural Society of Queensland:—

"The Gerbera is still a comparatively new flower to Queensland, having been introduced some eight or nine years ago from South Africa. The climate of Queensland appears to be well suited to the growth of this plant, and, as a result of cross-fertilisation and hybridisation (the former probably by bees and other insects), a wide range of delicate shades of colour has been secured. By reason of its attractiveness and general fine qualities, it has become so popular in this short time that practically every flower-garden has at least a few Gerberas; in fact, many do not consider their flower-garden complete without a number of them.

"Its popularity is undoubtedly well merited, for, first of all, the plant is a perennial, so that, instead of having to be renewed every year, it multiplies, in some cases, to quite a remarkable extent; then the flowers are very attractive by reason of their range of colour and size; moreover, the plants are in bloom nearly the whole year, and the flowers will last as long as three weeks in cool weather, and in the summer much longer than most flowers. Having very long stems, they are particularly well suited for table decoration.

"The first thing for the beginner to do is to get an initial stock of good seeds or plants. Plant in spring or autumn, preferably in spring, because the plants make very little growth during winter. The seeds will germinate at any time except May to August, when they are very inactive, and if sown during this period will usually lie dormant for some time. One batch of seeds I sowed in May last year did not come up until August. The seeds should not be kept any length of time before sowing, but should not be sown until properly ripe. If kept for more than four months, very poor result will follow. Seeds with holes in are usually of little value, but I have had cases of such seeds germinating with holes in the leaves. To sow the seeds, make the soil uniformly fine and lay the seeds on their sides about 1 inch apart. The seeds sprout from just below the hairy end, so that in order to get the best results they should be sown the way they stand in the seed head, but good results will follow either method. Cover the seed lightly with fine soil and protect with grass or a piece of hessian. Keep the latter moist until the plants show above the soil. The best method to follow is to sow the seeds in the open—in a suitable spot to receive the morning sun. I have always had good results by following this practice; for, if sown close together in a shallow seed pan, the roots are prevented from spreading naturally, they become entangled, and the plant is stunted. In one instance last season I obtained 32 plants from a head of 40 seeds sown in the open beside the plant from which the seed was taken.

" The seedlings can be transplanted very early, even when only getting the third leaf; the earlier the better, for the plants always grow much better when given plenty of room. Of course, care has to be exercised with very small plants.

"Plants of the same age vary considerably in some cases, due to the time when they were planted and to the nature of the plant. Some plants are naturally very slow growers, while others grow with remarkable rapidity. The size of the flower does not depend upon whether the growth is vigorous or not. I have had flowers varying in size from 2 inches to 5½ inches diameter; and my best one is one of the strongest growers. However, the most vigorous growers usually bear a small flower in larger quantity, and are much better for market purposes; whilst the larger blooms, produced in smaller quantities, are best for show purposes.

"Dead stalks and dead flowers should always be removed, for if they are not, the flowers coming up are very often malformed.

"A seedling will sometimes give very faulty flowers at first, but often these improve and later on become perfect blooms. If such a seedling gives very small blooms, it would be advisable to remove it; if it is a fair size, but does not improve with time, throw it over the back fence. By having a garden full of perfect blooms you can be sure of getting good results from your seeds, but, on the other hand, a number of faulty blooms will give faulty seedlings.

"From the original two dozen seeds I planted I secured three distinct colours, and from these and a few others added since I now have a large number of shades—some being much better than the originals, simply by removing all plants yielding deformed flowers.

"Most of my flowers are semi-double. These are best for show purposes, for, if a few petals are faulty, they can be removed and so improve the appearance of the flower. The single variety cannot be improved in this way.

"Dividing is perhaps the most important factor in the cultivation of the Gerbera. The stronger growing plants must be divided every year, or else the plants become choked and the size and number of the flowers decrease. Some do not require to be divided for some years. As an example, to show the variation in the growth of different plants, I raised a number of seedlings in the same bed and under exactly the same conditions. When they were not quite a year old I divided those requiring division. One seedling was divided into fourteen separate plants, while some of the seedlings could not be divided.

"The plants can be divided at any time except during the winter months. Plant at least 18 inches apart to allow plant to spread.

"If the plants begin to wither and die, they have either been too long in the one spot or else their roots are diseased. To save the plants, divide at once, and replant in fresh soil. If the roots are very long, cut them off to 5 or 6 inches before replanting. In the case of diseased roots, cut the offenders off, divide, and replant, and the plants will thrive again. I have never lost any plants, if withered, when treated in this way. Plenty of soapy water keeps the plants clean, and none that have had this treatment have suffered with diseased roots.

"Vigorous growers require plenty of manure and water, and the ground must be well drained.

"When the blooms are picked during the day they invariably close in the evening. Blooms to be shown in the evening should always be gathered one, or in some cases two, days before the show. Another point—colours appear quite different at night, so to match and select colours for night show they should always be compared on the preceding night. I have one variety the flowers of which keep open on the night of the day on which picked, but all the others should be gathered at least one day earlier.

"To collect your own seeds, pick the stalk when the flower is dead, and put away in a box for two or three weeks for the seeds to mature. Then pick the seeds out and sow as soon as convenient."

A NEW COTTON AS A SUBSTITUTE FOR SEA ISLAND COTTON.

Owing to the ravages of the boll weevil in the United States of America, the production of Sea Island cotton in that country has seriously declined; and the opinion of the United States Department of Agriculture, based on the very rapid decline in production during the past two years, is that Sea Island cotton may be doomed.

The "Weekly News Letter" issued by the Department says that, for the ten years ending in 1916, the average annual production of Sea Island cotton was about 90,000 bales. The production in 1918 was only about 40,000 bales; and the estimates for 1919 are as low as 20,000 bales.

Without Sea Island cotton, many industries will be seriously crippled; if, indeed, they are not destroyed, and many planters will lose the major part of their income—unless some other variety of cotton of equally long staple and high quality and more nearly immune from boll weevil attack is generally accepted and grown in the Sea Island districts of the South-eastern United States.

There is such a variety of cotton. It is known as Meade cotton, and was originated by the Bureau of Plant Industry, United States Department of Agriculture.

It is as fine as Sea Island cotton and as long. It can be handled on the regular Sea Island gins. It makes profitable yields under boll weevil conditions.

But—will the planters and ginners take sufficient interest and co-operate closely enough to ensure the continued production of an ample supply of pure Meade seed? Upon the answer to that question, in the opinion of the Department, depends the solution of the problem.

Of the 3,000 acres of Meade cotton growing this year, not more than 500 acres can be safely reported as pure stock. In order to keep it pure, no other variety of cotton must be planted in the same neighbourhood. The Department of Agriculture is encouraging communities of farmers to organise for the purpose of growing only the Meade cotton and of keeping up the standard by continued selection and careful ginning.

Tropical Industries.

THE SUGAR INDUSTRY AT MACKAY.

The General Superintendent of the Bureau of Sugar Experiment Stations has returned from the Mackay district. Reporting upon the general appearance of the town and district, Mr. Easterby stated that the business portion of the township had by now been largely repaired, and the celerity with which premises had been reroofed and restored to their normal appearance was little short of marvellous, taking the scarcity of buliding materials into account. The sound of hammer and saw could be heard everywhere. The streets had been thoroughly cleaned up, and the greatest credit was due to the authorities for the present clean and sanitary appearance of the town.

The residential part of Mackay had also to a large extent been repaired; but many houses still present a desolate appearance, with their roofs off and walls collapsed, exposing the furniture within to the elements. The terrific rainfall which continued for three days after the cyclone, amounting to 55½ in., did irreparable damage to the household goods of those unfortunates whose houses were unroofed or walls blown in. Many dwellings were blown clean off their blocks, but are still inhabited. In other cases the blocks gave way and the houses gently slid to the ground, or the blocks have come up through the flooring. The courage displayed by the people of the Mackay district in meeting the disaster and restoring their premises and carrying on their usual avocations is beyond praise and characteristic of the people of North Queensland, whom no flood or cyclone seems able to terrify. This is one of the reasons why the sugar-growers of North Queensland deserve every consideration and sympathy from the consumers in the more Southern parts of Australia. In order to settle the Northern littoral and produce sugar for Australia, canegrowers must always face the risks of cyclone and flood. The damage along the river front is, of course, the first thing that strikes the eye of the present visitor to Mackay; the partly broken wharves, the steamers sunk or driven ashore, and the disaster to the bridge are all visible as the tender advances from Flat-top up the river; but the streets have resumed their wonted activity, and business is being carried on as usual.

Many of the farmers' residences and all the mill buildings in the outlying district suffered damage to a greater or less extent, and will require a good deal of expenditure to refit them; but this work is for the most part being undertaken as rapidly as possible. A large number of country dwellings have been put in order again; but the outbuildings, such as sheds and stables, have been left to later on. Practically every windmill in the district was blown over, and a considerable number of tanks also. Coming to the damage to the growing crops of cane, Mr. Easterby said that the most serious damage done appeared to be confined to the area within about 9 miles of town. Thus at the Sugar Experiment Station, 3 miles out, fully 50 per cent. of young cane was literally snapped off on two or three plots, while more advanced cane stood the blow better. Around the Racecourse the damage to cane on many farms would vary from 10 per cent. to 50 per cent. on an average.

Cane at the Palms Plantation had also been much knocked about and destroyed. Farther along the line to Finch Hatton, the crops appeared to have weathered the storm well; and good reports were received from most of the areas at McGregor's and Owens Creek. On the Homebush area, while individual farms suffered, the loss was not as severe as nearer Mackay. At North Eton the crops were fair to good, and the damage not very great. As far as possible, the General Superintendent visited nearly every sugar-growing area; and from a personal inspection of the greater part of the cane in the district he is inclined to put the average loss of cane at 20 per cent. to 25 per cent. at the present moment. The enormous rainfall from 1st January to 13th February—viz., 91½ in.—undoubtedly had a large influence in checking the growth of cane which was not nearly so forward as it should have been, apart from the damage caused by the cyclone. An estimate of damage to cane by such a furious cyclone is difficult to estimate; and it may be that such estimate will require revising a few weeks later on. In any case the present season at Mackay was not going to be a record such as last year. During the week ended 23rd February the weather was extremely hot and fine, and it was wonderful how rapidly the cane picked up during that time. The cane is rapidly making new leaves, and now presents a much more attractive appearance than it did even so recently as three weeks ago. Of course, this making of new leaves must be at the expense of the cane plant, and will, no doubt, retard growth for a while. When the cane is snapped off, there can be no recovery for the season; and where canegrowing land has been completely washed away, as it has been in some instances on the river and creeks, the loss is a total one. All these hit the individual very hard; but the collective loss will not be so great as originally anticipated.

Crops showing about 1 ft. to 2 ft. of cane appeared to suffer most. The late-cut ratoons were scarcely injured, and the longer cane bent more successfully to the wind's fury and was laid over flat, from which position it has now for the most part recovered. The variety that was most injured was H.Q. 426, or Clark's Seedling, a cane of high sugar content. D. 1135 and 1900 Seedling stood well, as did also Malagache in some districts.

THE SUGAR INDUSTRY IN THE NORTH.

The General Superintendent of the Bureau of Sugar Experiment Stations has returned to Brisbane from an official visit to the Sugar Experiment Stations at Mackay and Innisfail and the Entomological Bureau at Meringa, near Cairns. The continued drought is giving rise to a good deal of anxiety, and, though some little rain has fallen at Mackay and Cairns, it is quite insufficient to do more than freshen up the cane. At Mackay the late-planted cane was continuing to hold out well and looked remarkably well in places. Should rain continue to hold off, however, the condition of the cane will become serious as it advances in growth and makes a greater demand upon the soil moisture. The crushing of the present season's crop is now drawing to a close, and it is anticipated that the yield will only amount to some 35,000 tons of sugar. The density in the cane or commercial cane sugar has been exceedingly high this season; but it is freely stated that relatively less sugar has been extracted this year, the difficulties of manufacture being greater, owing to some unknown reason. The dry nature of the cane may be the cause, or there may be other bodies present affecting the polariscope. It is a subject for chemical investigation. The work of the Sugar Experiment Station was being carried on satisfactorily, and the new varieties were making good headway in spite of the dry weather. New tests were initiated for the succeeding season's work, including chemical and commercial trials of foreign canes. The Laboratory is being kept employed in the analyses of canes, fertilisers, and soils.

The Innisfail district is much drier than it has been for years, and beyond a few light showers no rain of any value has fallen for some months. This, however, up to the present, has given farmers a fine opportunity to harvest the crop and ratoon it, to plant next season's cane, and thoroughly cultivate the land. The whole of the district looks beautiful at the present time; the young plant cane has struck well; and there is almost a total absence of weeds. The young cane is now in a great position to respond vigorously to the first rains.

The cane planted at the new station has germinated beautifully, and the whole place looks a picture. The varieties are coming along splendidly. Due to the difficulties of shipping, fertilisers are very hard to procure; and the experiments in this direction are now awaiting manures, which are very slow in coming to hand. Goondi Mill was to close down on the 3rd of this month, Mourilyan on the 17th, and South Johnstone may go on till early January. The season has been satisfactory at all three mills, and the commercial cane sugar has been high throughout.

The Cairns district was also looking well, but further rain is here needed badly. Babinda Mill will crush into January; while Hambledon and Mulgrave are expected to finish before Christmas. The crushing at these mills has been satisfactory. Farmers are taking advantage of the crushed limestone being turned out by the Government at Chillagoe. Large quantities are being ordered, the price being 25s. per ton on trucks at Chillagoe.

Reports from the Lower Burdekin indicate that, although fair to good rains have been experienced recently, a good deal more is wanted.

The early-planted cane in the Herbert River is also stated to be suffering from abnormally dry weather.

At Bundaberg the rains that fell about six weeks ago were useful in inducing a good strike of cane, but further rains are now urgently required.

Given good rains immediately and no floods or cyclones, there should be an excellent crop north of Townsville next season.

Forestry.

CONSERVANCY OF OUR FORESTS, No. 2.

By THE EDITOR.

In continuation of our introductory article on the subject of our Queensland timber resources, we will consider the rate of growth of some of our soft-wood timber trees.

Previous to the year 1879, extirpation had been going on for a long series of years, and little anxiety had been felt as to future supplies. In 1879, however, action was taken by the Government, when certain regulations were issued defining the diameter of kauri and hoop pine which it would thenceforward be legal to cut.

Those first regulations, then promulgated by the Lands Department, prohibited the cutting down of any pine tree having a less diameter than 3 ft. It will not be matter of surprise to those who know anything of timber-getting at the present day, that such a regulation should have caused consternation and a general outcry amongst the timber-getters.

Leaving kauri pine out of the question, it is well known that not much hoop pine attains a diameter of 3 ft. even in the most favoured localities. And when we consider that large quantities of this valuable timber grow (or should we say "formerly grew"?) in stony and clayey mountain scrubs, with bleak aspects, it may well be imagined that, there, a diameter of 2 ft., will be seldom exceeded. Trees of 3 ft. diameter are few and far between, and often, when they were obtained, they were found "pipey,"* or else at such a distance from a mill or navigable water as to render them of no value to the timber-getter, who would have to expend more in transporting the logs to a market than he would obtain for them on arrival.

The late Mr. Turnbull, who, at the time I am writing of, was a surveyor at Mooloolah, and had ample opportunities of seeing the operations of the timber-getters, assured me that he had seen trees there of hoop pine which had attained a diameter of 3, 4, and even of 6 ft. These were not numerous; but there is the fact that, in certain favourable situations, the hoop pine will attain very large dimensions.

Against this, a Pine Mountain timber-getter informed me that the largest pine-tree in that locality would not measure 2 ft. in diameter, whilst, taking the average of what had, been cut there, it would be found to be not over 18 in.

Now, about the rate of diametric growth. The hoop pine increases at the rate of ¾ in. per annum, and will top the scrub at a diameter of 10 in., thus following the example of the kauri in seeking the light before increasing in diameter.

The kauri pine makes little wood until it has shot up so as to top the rest of the scrub. If the other scrub timber be short, so will be the kauri; on the other hand, if the surrounding scrub be high, the kauri will likewise be lofty; and it is in the latter description of scrubs that the best timber is obtained. Now, by the time a kauri sapling is 12 in. in diameter, it has done all its upward growth. From this period the yearly growth is from 5 to 9 in. in circumference. Instances have been known, and can be verified, of an annual growth of 12½ in. in circumference; but, of course, a great deal depends upon the seasons—a warm, rainy season being the most favourable. This rate of growth is maintained pretty evenly until the tree reaches from 40 to 50 in. in diameter, when the growth slackens off, but does not cease.

The kauri, at this latter stage, seems to have attained maturity, the timber being more durable, less liable to flaws, and far more profitable for all parties concerned in its working.

The red cedar makes three growths, equivalent to an increased diameter of 2 in. every three years.

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* On a large timber reserve at the mouth of the Maroochie River, the late Mr. W. Pettigrew, in 1897, measured some pine trees, and found them to be 18 ft. in girth at 5½ ft. from the ground. These large trees were straight for 40 ft., but were "pipey." He reckoned the rate of growth at about 1 in. per annum in girth.

Now, to apply these figures. To cut the kauri pine on its attaining a diameter of less than 3 ft. is a most disastrous policy, as the following figures (which can easily be verified by anyone accustomed to timber measurements) will show:—

Taking the length of a tree at 60 ft., and considering the circumference as three times the diameter for practical purposes, we find that such a tree at—

Diameter. Inches.	Circumference. Inches.		Side of Square. Inches.		Superficial Feet.
20	60	=	15	will yield	1,124
24	72	=	18	will yield	1,620
36	108	=	27	will yield	3,644
48	144	=	36	will yield	6,480
60	180	=	45	will yield	10,124
66	198	=	49, 50	will yield	12,124

Thus, a tree, which at 2 ft. diameter would yield 1,620 superficial feet of timber, would, if allowed to grow five years longer, yield 3,644 ft., or, in other words, it would be worth over double the money; and, if allowed to grow for ten years, would yield exactly four times the amount of timber which a diameter of 2 ft. would yield.

On the first supposition—or, say that a tree requires six years to increase from 2 ft. in diameter to a diameter of 3 ft.—we have a direct gain of 125 per cent., equivalent to 21 per cent. per annum. In a less degree, the above will apply to hoop pine, beech, and cedar.

I now come to the question as to the quantity of timber, or rather, as to the number of 40-ft. logs, which a mill, cutting its 100,000 ft. (log measurement) weekly, would require annually to keep it in full work. The following table will show this distinctly:—

20 inches diameter	4,194 logs
24 inches diameter	2,911 logs
36 inches diameter	1,303 logs
60 inches diameter	631 logs
66 inches diameter	597 logs

A well-known Brisbane sawmiller said: "I have counted up the sizes of 1,022 logs (not trees) cut at the Mooloolah sawmill lately, and they were:—Under 20 in., 400; 20 in. to 24 in., 365; 24 in. to 36 in., 192; above 36 in., 5."

Taking the average number of the logs, the two estimates do not materially differ.

Taking into consideration the number of sawmills in the State, how long will it be before our scrubs will be denuded of soft timber, and our forests of hardwoods, at this rate of working? Our timber lands, extended though they may be, are not inexhaustible. America and Canada have long since discovered that these vast forests have limits. Yet a journey may be made from Patagonia, the extreme limit of South America, to the Arctic Circle in North America, a distance of nearly 9,000 miles, without leaving the forests; and, further north, the Arctic pine forests stretch in an almost continuous belt through three-quarters of the world, with a breadth of from 1,000 to 1,400 miles, almost wholly composed of conifers, such as the Siberian Fir (*Abies siberica*), Larch (*Larix siberica*), *Pinus umbra*, *Picea olovalate*, &c.

The area of the Queensland forests, as given in the Official Year Book of the Commonwealth of Australia, 1901-1918, is 1,142,885 acres permanent and 2,804,967 acres temporary reserves, the total forest area amounting to 40,000,0000 acres; but the actual area of wooded land is probably, in the case of all the States, much greater than is here shown, as considerable areas not included as forest lands in the estimate possess timber of local value. From this point of view, the area of wooded land in Queensland may be estimated at 143,000,000 acres. There were, in 1917, three State forest nurseries covering 15 acres, and three plantations with an area of 100 acres; but we have no statistics as late as 1919. The revenue of the State Forestry Department in 1917-1918 amounted to £66,660, and the expenditure totalled £13,930. To show the extent to which our forests have been depleted, consider the quantities of local timber sawn or hewn in the State during the years 1913-1917:—

Year.	Superficial Feet.
1913	156,634,000
1914	168,456,000
1915	144,950,000
1916	121,850,000
1917	111,663,000
Total	703,553,000

No satisfactory estimates of the total value of the forest production of the State are available; nor can we form any idea of the value of trees cut down and abandoned by splitters, nor of the tops of trees left in the forests and scrubs, nor of the thousands of trees stripped of their bark and dying in consequence, nor of the enormous waste resulting from sleeper-getting, shingle and rail splitting. As far as exports and imports of timber from and to the Commonwealth are concerned, these have run into many millions of feet, dressed and undressed. In 1913 the value of imported timber was £2,926,476, declining between that year and 1918 to £1,406,582; and exports during the same years totalled, respectively, £1,011,041 and £247,056.

Now, concerning the machinery employed in dealing with a considerable portion of the log timber. Taking forest and other sawmills and factories in Queensland, we have the following particulars up to the year 1917:—

Number of factories 287, employing 4,015 persons. Horse-power of engines used, 8,932; value of plant, £448,423; amount of wages paid during the year, £467,108; value of material worked up, £690,490; value of the output £1,461,557.*

Let us here consider how our forests were depleted between the years 1913 and 1917. In that time the timber sawn and hewn, leaving out waste, amounted to 703,553,000 superficial feet. Supposing that a log 60 ft. in length and 2 ft. in diameter will yield 1,620 superficial feet, then it is clear that the number of logs required to produce that quantity of saleable timber would be 4,323,181. What has been done to replace this wealth of timber trees?

There is an even more important aspect of the forestry business, and that is the destruction of the forests by cutting immature timber. Day after day, the railways are bringing in truck loads of pine from 10 to 12 in. in diameter. Hundreds of such soft-wood saplings are sent to market; and not only is this the case with pine trees, but also with hardwood, owing to the demand for telegraph poles, stumps for house building, &c.—necessities which have to be supplied, and which could be perpetually supplied if only care were taken to plant young trees in their places. This is certainly being done in some districts, but it should have been thought of fifty years ago. Some years ago I was in the Black Forest (Schwartz Wald), in the Grand Duchy of Baden, Germany. It is well named the "Black" Forest, for it is a grand forest of pine trees, from which supplies of timber have been obtained for generations; yet the forest is apparently inexhaustible, and thousands of splendid trees darken its avenues. Whenever trees are felled, others are planted in their places, so that the supply is always kept up. In Queensland, many trees have been planted in the Northern scrubs—pine, beech, red cedar, and silky oak; the latter a tree which has been ruthlessly destroyed for the purpose of making banana crates. Much has also been done in the way of tree-planting on Fraser's Island, Wide Bay; but much remains to be done in the Northern scrubs to replace the fine cedars and beeches, which have been exploited almost to extinction.

Posterity has naturally done nothing for the present generation, but it is a duty devolving on the latter to provide timber supplies for those who come after us.

This subject will be further dealt with in future issues of the Journal, space permitting.

FORESTRY IN THE UGANDA PROTECTORATE.

The British East African Protectorate lately created a separate Forestry Department. Before this—1917-1918—the interests of Botany and other scientific subjects were included in one Department; but at the beginning of that financial year a separate Department was created, with Mr. R. Fyffe as Chief Forest Officer, who has now issued the first Annual Report on the Forestry Department for the year ended 31st March, 1918.

The work of the year was largely of a preparatory nature, including surveys, the construction of roads, the erection of buildings, a sawmill, and other work necessary to facilitate future operations. Time was, however, found to clear 170 acres of ground on a Railway Fuel Reserve, and to plant it with 820,000 young trees; to start an arboretum and nursery; to collect and distribute 697 lb. of tree seeds; to advance work connected with a forest herbarium and museum; and to collect 500 lb. of rubber in the Budongo Forest. The rubber reserves of this forest are to be developed. Of timber trees, in addition to those mentioned, *Markhamia* (*Dolichandrone*) *platycalyx*, one of the best timbers of the region, 10,000 of other species were planted. Of introduced trees, Teak and *Eucalyptus* spp. are making rapid growth.—"Bulletin of the Royal Botanic Gardens, Kew."

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* Since this was written, we have received the annual report of the Director of Forests, and in a future issue of the Journal any discrepancies will be corrected and figures brought up to date.

Botany.

FLORA OF THE BUNYA MOUNTAINS.

BY C. T. WHITE, F.L.S., Government Botanist.

In September-October I had the privilege of spending a week on the Bunya Mountains with the members of the Royal Australian Ornithologists' Union on the occasion of their annual reunion and camp-out; and the following account of the flora of the mountains has been compiled from specimens gathered on that occasion. It does not profess to be complete, as visits at different times of the year, and to spots additional to those visited by the members of the Union, would no doubt add considerably to the list. It should, however, give a fair idea of the flora of the locality, and, further, give botanists an idea of what additional species are likely to be met with. Only those plants growing on the higher parts of the mountains, at an altitude of 2,000 ft. and over, are listed. For the sake of convenience the classification and nomenclature of Bailey's ''Queensland Flora'' has been adhered to, even in the case of the ferns.

ACKNOWLEDGMENTS.

The specimens were mostly personally collected, but help was received from other members of the party, and in this respect acknowledgments must be made to Dr. J. Burton Cleland, Mr. H. Tryon, Mr. H. W. Andrew, and Dr. and Mrs. Price for specimens which helped to swell the following list.

Most of the specimens have been worked out by my assistant, Mr. W. D. Francis, and my thanks are due to him for the care taken over the matter. For the identification of one Eucalypt (*E. tereticornis*) I am indebted to Mr. J. H. Maiden, I.S.O., F.R.S., Director of the Botanic Gardens, Sydney, and for the two Loranthaceæ recorded to Mr. W. F. Blakely, Botanical Assistant, Botanic Gardens, Sydney.

GENERAL ACCOUNT.

On the Bunya Mountains, four main types of vegetation are met with, all very sharply defined the one from the other—(*a*) the open grass lands; (*b*) open forest; (*c*) dense rain forest, popularly known in Queensland as ''scrub''; and (*d*) the swamps. The open grass land is mostly characteristic of the bald hills, such as Mowbullan, covering their tops and the slopes for a considerable area. They give a very beautiful and park-like appearance to the vegetation, backed up as they are by the solid wall of timber of the ''scrub.'' Among the grasses are found different smaller flowering plants, such as *Mentha satureioides* (Pennyroyal), *Craspedia Richea* (Billy Buttons), *Viola betonicæfolia* (Violet), *Galium Gaudichaudii, Helichrysum apiculatum, H. bracteatum, Helipterum anthemoides* (Everlastings), *Wahlenbergia gracilis* (Bluebell), *Acæna ovina, A. sanguisorbæ*, &c. Isolated trees are found, principally *Acacia decurrens var. pauciglandulosa* (Green Wattle) and *Eucalyptus tereticornis* (Blue Gum).

The open forest has a limited tree flora, the principal species being *Eucalyptus tereticornis, E. eugenioides, Sterculia diversifolia, Exocarpus cupressiformis, Angophora intermedia, Canthium buxifolium, Myoporum acuminatum,* and *Casuarina torulosa.*

The rain forest or ''scrub'' is, of course, botanically, the richest type of plant association on the mountains. The outstanding tree is the ''Bunya Pine'' (*Araucaria Bidwillii*). In places, this species is replaced by the ''Hoop Pine'' (*Araucaria Cunninghamii*), and as both trees occur in abundance they give a most characteristic appearance to the vegetation of the mountains which well warranted the old title for them of Araucaria Ranges under which locality name are recorded a number of Baron von Mueller's specimens collected there in 1856. A tree attaining large dimensions is *Elæocarpus Kirtonii, F. v. M.* Locally it is known as ''White Beech'' or ''Mowbullan Whitewood,'' and in some of the scrubs occurs in such abundance as to warrant them being called ''Beech Forests'' by the timbergetters, surveyors, &c. It is a large tree with a smooth white barrel of very characteristic appearance. One of the tallest trees in the scrub, but slender-stemmed in comparison, is *Acacia Maidenii*, in the heart of the scrub it is rare, but is very abundant on the edge bordering the grass and open forest land; in the latter situation it does not attain any great height, but branches out into a fairly dense bushy tree. *Geijera Muelleri* and *Pittosporum undulatum* are two very abundant trees; both were in full flower at the time of our visit.

The swampy areas are relatively only small patches. The dominant plants are *Ranunculus rivularis var. major, Lythrum salicaria, Sium latifolium, Hydrocotyle vulgaris, Phragmites communis, Pennisetum compressum,* and a large sedge (not in flower at the time of our visit and therefore undeterminable).

LIST OF PLANTS COLLECTED.

RANUNCULACEÆ.

Clematis glycinoides, *DC.*
Clematis glycinoides, *DC.*, var. submutica, *F. v. M.*
Ranunculus lappaceus, *Sm.* Common Buttercup.
Ranunculus rivularis, *Banks and Sol.*, var. major, *Benth.* Swamp Buttercup.
Ranunculus parviflorus, *Linn.*, var. australis, *Benth.*

MENISPERMACEÆ.

Legnephora Moorei, *Miers.*
Stephania hernandiæfolia, *Walp.* Tape Vine.

CRUCIFERÆ.

Lepidium ruderale, *Linn.* Wild Cress.

CAPPARIDEÆ.

Capparis nobilis, *F. v. M.* Wild Lemon.

PAPAVERACEÆ.

Papaver horridum, *DC.* Native Poppy.

VIOLARIEÆ.

Viola betonicæfolia, *Sm.* Wild Violet.

PITTOSPOREÆ.

Pittosporum undulatum, *Vent.*
Citriobatus pauciflorus, *A. Cunn.* (?). Leaves only.
Citriobatus multiflorus, *A. Cunn.*, var. linearis, Bail.

POLYGALEÆ.

Polygala japonica, *Houtt.*

CARYOPHYLLEÆ.

Cerastium vulgatum, *Linn.* Mouse Ear Chickweed.
Stellaria glauca, *With.* Starwort.

MALVACEÆ.

Abutilon oxycarpum, *F. v. M.*

STERCULIACEÆ.

Sterculia discolor, *F. v. M.*
Sterculia diversifolia, *G. Don.* Kurrajong.
Tarrietia argyrodendron, *Benth.* Stavewood.

TILIACEÆ.

Elæocarpus Kirtonii, *F. v. M.* Mowbullan Whitewood.

GERANIACEÆ.

Geranium dissectum, *Linn.*, var. australe, *Benth.*

RUTACEÆ.

Melicope erythrococca, *Benth.*
Evodia micrococca, *F. v. M.*
Zanthoxylum brachyacanthum, *F. v. M.* Satin Wood.
Geijera Muelleri, *Benth.* One of the commonest trees in the scrub.
Acronychia lævis, *Forst.*

MELIACEÆ.

Amoora nitidula, *Benth.*
Cedrela toona, *Roxb.*, var. australis, *C. DC.* Red Cedar.
Flindersia collina, *Bail.* Broad-leaved Leopard Wood.

OLACINEÆ.

Villaresia Moorei, *F. v. M.* Churnwood.

CELASTRINEÆ.

Celastrus australis, *Harv.*
Celastrus bilocularis, *F. v. M.*
Denhamia pittosporoides, *F. v. M.*

RHAMNACEÆ.

Alphitonia, sp.

AMPELIDEÆ.

Vitis antarctica, *Benth.*
Vitis nitens, *F. v. M.*
Vitis acris, *F. v. M.*
Vitis clematidea, *F. v. M.*
Vitis hypoglauca, *F. v. M.*

SAPINDACEÆ.

Diploglottis Cunninghamii, *Hook. f.* Native Tamarind.
Cupania xylocarpa, *A. Cunn.* A Foam Bark.
Nephelium semiglaucum, *F. v. M.*

ANACARDIACEÆ.

Rhodosphæra rhodanthema, *Engl.* Deep Yellow Wood.
Euroschinus falcatus, *Hook. f.* A Maiden's Blush; Ribbon Wood.

LEGUMINOSÆ.

Lespedeza cuneata, *Don.*
Hardenbergia monophylla, *Benth.* Trailing Sarsaparilla.
Derris oligosperma, *Schum. et Lauterb.* Fish Poison Vine.
Castanospermum australe, *A. Cunn.* Black Bean Tree; Moreton Bay Chestnut.
Acacia Maidenii, *F. v. M.* Sally Wattle.
Acacia decurrens, *Willd.*, var. pauciglandulosa, *F. v. M.* Green Wattle.

ROSACEÆ.

Rubus moluccanus, *Linn.* Native Raspberry.
Rubus parvifolius, *Linn.*
Rubus rosæfolius, *Sm.* Rose-leaf Raspberry.
Acæna ovina, *A. Cunn.*
Acæna sanguisorbæ, *Vahl.*

CRASSULACEÆ.

Tillæa verticillaris, *DC.*

HALORAGEÆ.

Haloragis sp. (leaves only).

MYRTACEÆ.

Angophora intermedia, *DC.* Apple Tree.
Eucalyptus eugenioides, *Sieb.* White Stringy Bark.
Eucalyptus tereticornis, *Sm.* Queensland Blue Gum.
Myrtus Hillii, *Benth.* Scrub Ironwood.
Eugenia spp. 2 (leaves only).

LYTHRARIEÆ.

Lythrum salicaria, *Linn.* Purple Loosestrife.

ONAGRARIEÆ.

Epilobium Billardierianum, *Ser.*

PASSIFLORACÆ.

Passiflora Herbertiana, *Lindl.* Wild Passion Vine.

CAPRIFOLIACEÆ.

Sambucus xanthocarpa, *F. v. M.* Elderberry.

UMBELLIFERÆ.

Hydrocotyle vulgaris, *Linn.* Pennywort.
Apium leptophyllum, *F. v. M.* A Wild Carrot.

ARALIACEÆ.

Panax elegans, *F. v. M.* Celery Tree.

RUBIACEÆ.

Canthium buxifolium, *Benth.*
Morinda jasminoides, *A. Cunn.*
Psychotria daphnoides, *A. Cunn.*
Galium Gaudichaudii, *DC.*

COMPOSITÆ.

Brachycome microcarpa, *F. v. M.*
Olearia stellulata, *DC.*
Olearia elliptica, *DC.*
Vittadinia australis, *A. Rich.*
Helipterum anthemoides, *DC.* White Everlasting, Daisy.
Helichrysum bracteatum, *Willd.* Yellow Everlasting.
Helichrysum apiculatum, *DC.*
Cassinia quinquefaria, *R. Br.*
Acomis rutidosis, *F. v. M.* (?). Leaves only.
Craspedia Richea, *Cass.* Billy Buttons, Bachelors' Buttons.
Podolepis acuminata, *R. Br.*
Cotula australis, *Hook. f.*
Erechthites Atkinsoniæ, *F. v. M.*
Erechthites arguta, *DC.*
Erechthites quadridentata, *DC.*
Senecio amygdalifolius, *F. v. M.*
Senecio lautus, *Forst.*, var. lanceolatus, *Benth.*
Picris hieracioides, *Linn.*
Sonchus oleraceus, *Linn.* Sow Thistle.

STYLIDEÆ.

Stylidium graminifolium, *Sw.* Jack Jumper.

GOODENOVIEÆ.

Velleia paradoxa, *R. Br.*

CAMPANULACEÆ.

Wahlenbergia gracilis, *A. DC.* Blue Bell.

EPACRIDEÆ.

Lissanthe strigosa, *R. Br.*

MYRSINEÆ.

Myrsine variabilis, *R. Br.*
Embelia australiana, *Benth.*

EBENACEÆ.

Diospyros australis, *Benth. & Hook.*

STYRACACEÆ.

Symplocos Thwaitesii, *F. v. M.* (?). Leaves only.

OLEACEÆ.

Jasminum racemosum, *F. v. M.*
Notelæa longifolia, *Vent.*

APOCYNACEÆ.

Carissa ovata, *R. Br.*
Alyxia ruscifolia, *R. Br.*, var. pugioniformis, *Bail.*
Alstonia constricta, *F. v. M.* Tonic Bark.
Lyonsia reticulata, *F. v. M.* Monkey Vine.

ASCLEPIADEÆ.

Tylophora grandiflora, *R. Br.*
Marsdenia rostrata, *R. Br.*

BORAGINEÆ.

Cynoglossum latifolium, *R. Br.*
Cynoglossum suaveolens, *R. Br.* Forget-me-not.

CONVOLVULACEÆ.

Ipomœa plebeia, *R. Br.*

SOLANACEÆ.

Solanum aviculare, *Forst.* Kangaroo Apple.
Solanum discolor, *R. Br.*
Solanum stelligerum, *Sm.* Devil's Needles.
Solanum furfuraceum, *R. Br.*
Solanum cinereum, *R. Br.*

BIGNONIACEÆ.

Tecoma australis, *R. Br.* Wonga Vine.
Tecoma jasminoides, *Lindl.* Leaves only.

ACANTHACEÆ.

Eranthemum variabile, *R. Br.*

MYOPORINEÆ.

Myoporum acuminatum, *R. Br.*

VERBENACEÆ.

Spartothamnus junceus, *A. Cunn.*
Verbena officinalis, *Linn.* Common Verbain.
Clerodendron tomentosum, *R. Br.*

LABIATEÆ.

Plectranthus parviflorus, *Willd.*
Mentha satureioides, *R. Br.* Pennyroyal.
Ajuga australis, *R. Br.* Australian Bugle.

AMARANTACEÆ.

Deeringia celosioides, *R. Br.*
Nyssanthes diffusa, *R. Br.*

CHENOPODIACEÆ.

Rhagodia hastata, *R. Br.*
Enchylæna microphylla, *Moq.* (?)

POLYGONACEÆ.

Polygonum plebeium, *R. Br.*
Polygonum minus, *Huds.*
Rumex crispus, *Linn.* Curled Dock.
Rumex Brownii, *Camp.*
Rumex acetosella, *Linn.* Sorrel.

PIPERACEÆ.

Piper novaæ-hollandiæ, *Miq.* Pepper Vine.
Peperomia reflexa, *A. Dietr.*

LAURINEÆ.

Cryptocarya obovata, *R. Br.*
Cryptocarya glaucescens, *R. Br.*
Cryptocarya triplinervis, *R. Br.*
Litsea dealbata, *Nees.*
Litsea reticulata, *B. & H.* Bolly Gum or Bally Gum.

PROTEACEÆ.

Grevillea robusta, *A. Cunn.* Silky Oak.

THYMELEACEÆ.

Pimelea pauciflora, *R. Br.*
Pimelea ligustrina, *Labill* (?). Leaves only.
Pimelea sp. Leaves only.
Wickstroemia indica, *C. A. Mey.*

LORANTHACEÆ.

Loranthus eucalyptifolius, *Sieb.*
Loranthus congener, *Sieb.* Both species parasitic on a number of trees, but the latter particularly abundant on *Acacia Maidenii,* and *Acacia decurrens,* var. *pauciglandulosa.*

SANTALACEÆ.

Thesium australe, *R. Br.*
Choretrum Candollei, *F. v. M.*
Exocarpus cupressiformis, *Labill.* Native Cherry.

EUPHORBIACEÆ.

Breynia oblongifolia, *Muell. Arg.*
Hemicyclia australasica, *Muell. Arg.*
Croton insularis, *Baill.* Native Cascarilla Bark.
Croton acronychioides, *F. v. M.*
Baloghia lucida, *Endl.* Scrub Bloodwood.
Claoxylon australe, *Baill.*
Acalypha capillipes, *F. v. M.*
Alchornea ilicifolia, *Muell. Arg.* Native Holly.
Mallotus philippinensis, *Muell. Arg.*
Homalanthus populifolius, *Grah.* Bleeding Heart.

URTICACEÆ.

Trema aspera, *Blume.* Peach Bush or Poison Peach.
Malaisia tortuosa, *Blanco.*
Pseudomorus Brunoniana, *Bureau.* Axe-handle Wood.
Ficus eugenioides, *F. v. M.* (?). Small-leaved Fig.
Ficus macrophylla, *Desf.* Moreton Bay Fig.
Ficus Watkinsiana, *Bail.* Large-fruited Fig.
Laportea gigas, *Wedd.* Stinging Tree.
Elatostemma reticulatum, *Wedd.*
Parietaria debilis, *Forst.*

CASUARINEÆ.

Casuarina torulosa, *Ait.* Forest Oak.

CONIFERÆ.

Araucaria Cunninghamii, *Ait.* Hoop Pine.
Araucaria Bidwillii, *Hook.* Bunya Pine.

ORCHIDEÆ.

Liparis mowbulana, *Bail.* (In leaf only.)
Dendrobium speciosum, *Sm.*, var. *Hillii, F. v. M.* Rock or Tree Lily. Some of the cliff sides were literally covered with this orchid in full bloom at the time of the visit.
Dendrobium gracilicaule, *F. v. M.*
Dendrobium pugioniforme, *A. Cunn.* Spear Orchid.
Dendrobium linguiforme, *Swartz.*
Dendrobium teretifolium, *R. Br.*
Dendrobium Beckleri, *F. v. M.*
Calanthe veratrifolia, *R. Br.*
Sarcochilus parviflorus, *Lindl.*
Sarcochilus falcatus, *R. Br.*
Diuris maculata, *Sm.*

LILIACEÆ.

Smilax australis, *R. Br.*
Rhipogonum album, *R. Br.*
Eustrephus latifolius, *R. Br.*, var. angustifolius, *Benth.*
Geitenoplesium cymosum, *A. Cunn.*
Bulbine bulbosa, *Haw.* Native Onion.
Dianella lævis, *R. Br.*
Dianella cærulea, *Sims.*

COMMELINACEÆ.

Pollia crispata, *Benth.*

JUNCACEÆ.

Xerotes multiflora, *R. Br.*
Xanthorrhœa arborea, *R. Br.* Grass Tree.
Juncus pauciflorus, *R. Br.*
Luzula campestris, *DC.*

CYPERACEÆ.

Cyperus tetraphyllus, *R. Br.*
Lepidosperma concavum, *R. Br.*
Gahnia aspera, *Spreng.*
Carex paniculata, *Linn* (?)

GRAMINEÆ.

Panicum pygmæum, *R. Br.*
Pennisetum compressum, *R. Br.* Swamp Foxtail.
Imperata arundinacea, *Cyr.* Blady Grass.
Andropogon refractus, *R. Br.* Barbed Wire Grass.
Anthistiria ciliata, *Linn.* Kangaroo Grass.
Aristida vagans, *Cav.*
Stipa micrantha, *Cav.* Bamboo Grass.
Deyeuxia Forsteri, *Kunth.*
Danthonia longifolia, *R. Br.*
Cynodon dactylon, *Pers.* Couch Grass.
Phragmites communis, *Trin.* Common Reed.
Poa cæspitosa, *Forst.*
Festuca bromoides, *Linn.*

FILICES.

Botrychium ternatum, *Sw.* Parsley Fern.
Alsophila australis, *R. Br.* Tree Fern.
Alsophila excelsa, *R. Br.* Tall Tree Fern.
Dicksonia antarctica, *Labill.* Mountain Tree Fern.
Dicksonia davallioides, *R. Br.*
Davallia pyxidata, *Cav.* Hare's Foot Fern.
Adianthum æthiopicum, *Linn.* Maiden Hair Fern.
Adianthum diaphanum, *Blume.*
Adianthum formosum, *R. Br.* Large Maiden Hair.
Hypolepis tenuifolia, *Bernh.*
Cheilanthes tenuifolia, *Swartz,* var. Sieberi, *Hook. f.*
Pteris falcata, *R. Br.*
Pteris paradoxa, *Baker.*
Pteris umbrosa, *R. Br.*
Pteris tremula, *R. Br.*
Pteris aquilina, *Linn.,* var. esculenta, *Hook.* Common Bracken.
Coodia aspera, *R. Br.*
Doodia caudata, *R. Br.*
Asplenium nidus, *Linn.* Bird's Nest Fern.
Asplenium flabellifolium, *Cav.*
Asplenium falcatum, *Lam.*
Asplenium umbrosum, *J. Sm.*
Aspidium aristatum, *Sw.*
Aspidium decompositum, *Spreng.*
Polypodium tenellum, *Forst.*
Polypodium serpens, *Forst.*
Polypodium confluens, *R. Br.*
Polypodium attenuatum, *R. Br.*
Notholæna distans, *R. Br.*
Platycerium grande, *J. Sm.*; Staghorn Fern. Though this fern was not seen on the visit, Mr. Walker informed us that Staghorn Ferns are to be found along certain creeks. It may be here remarked that in Queensland *Platycerium grande* is always known as the "Staghorn Fern" and *P. alcicorne* as the "Elkhorn Fern." In the Southern States the popular names are reversed for the two species.

Dairying.

SUDAN GRASS AS FODDER FOR STOCK.

In reply to a question as to whether Sudan Grass can be safely fed green to stock without any danger of poisoning, Mr. J. C. Brünnich, Agricultural Chemist, advised:—"We have never heard that Sudan Grass contained an excessive amount of cyanogenetic poison, and it may, therefore, be used safely to feed stock. Sometimes it is quite free of the poison, and only traces were sometimes found."

In corroboration of this statement, Mr. Cuthbert Potts, Principal of the Queensland Agricultural College, gives the following testimony as to the virtues of this grass as a stock food. He writes:—

"Without doubt this crop has shown itself one of the best fodders ever grown at the College. Planted early in the summer, three or four cuttings can be got off and made into ensilage or hay. The crop can be fed green or grazed. In our district the crop will live through the winter, remaining fairly green and making slow growth; and we have had the same planting stand over a period of three years with success. As a feed the grass is nutritious, and is well liked by both cattle and horses. In its green state it is a good milk-producer; and as hay it makes a splendid feed for working horses. When once established, Sudan Grass stands dry weather better than any other of our summer crops. Recently, however, it was reported that stock had been poisoned by grazing on Sudan Grass. To test this, the College carried out the following trial:—This winter we had a second growth of Sudan Grass which grew from July to September and had attained a height of nearly 3 ft. About 15 head of young bulls, 1½ to 2½ years of age, were allowed to graze this, and were allowed no other food. Further, six of the animals were starved for forty-eight hours before, so as to induce them to glut themselves with the Sudan Grass, as we considered that this would be as severe a test as possible. The remainder of the stock were well fed just before, so that they went on to the crop with full stomachs. These stock remained on the Sudan Grass for over two months. They have had no other feed, yet they all did exceptionally well. Certainly, there was no poisoning. This test does not prove that Sudan Grass is never poisonous, but it does indicate that under ordinary conditions the crop is quite safe to graze. The point is of importance, for, if it can be safely grazed, Sudan Grass has such qualities that it must become one of our most important summer crops."

BRAN FOR TOWN DAIRYMEN.

Mr. M. A. O'Callaghan, Chief of the Dairy Branch, Department of Agriculture, New South Wales, in 1912, published a most valuable work on "Dairying in Australia, Farm and Factory." Dealing with Fodders and Rations for dairy cows, he stated that bran is one of the most useful concentrated feeds to the dairyman. It contains, comparatively speaking, a large amount of albuminoid matter, and is fairly rich in carbo-hydrate matter and fat. Bran is deficient in lime, but it contains a good percentage of phosphorus, which is a very essential constituent of any ration for dairy cows, as it is strongly represented in the mineral matter of milk. Fed with lucerne hay, the deficiency in lime will be made up for; hence the value of the two as a combination. Bran, owing to the high percentage of albuminoids and phosphorus combined, acts as a stimulating food, and is thus very useful to dairy cows, and tends to increase the flow of milk. For cows that are kept in somewhat confined conditions, like town cows, bran is a very valuable food, as it keeps the cow in a suitable condition at the approaching calving time and after calving also.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Dr. Illingworth and Mr. E. Jarvis, Entomologists to the Bureau:—

The majority of the grey-back beetles are now in their third stage, the stage in which they do their greatest damage to the cane roots. We found them abundantly following the plough, both at Greenhills and Meringa. The first specimens of this stage, for this season, were collected on 25th January.

FIELD EXPERIMENTS.

The cane at Meringa, which was badly infested with *frenchi* grubs early in the season, continues to improve. Since this field is near by, we have been able to keep close observation upon the activities of the grubs, and their effect upon the growth of the cane.

During the past month some small animal—presumably a bandicoot—has dug small holes near the roots of the infested stools. Investigation shows that these holes are confined to the diseased areas, for there is no digging at the roots of the healthy canes. Furthermore, it is now almost impossible to find *frenchi* grubs under the stools where this animal has worked.

We made attempts to catch the animal with various rattraps, baited with grubs, without success. In every instance the bait was removed from the trap without springing it.

Our 10-acre plots at Meringa are now all ploughed for the second time, in preparation for early planting. The second crop of Mauritius beans on part of this was very heavy, and went under well (25th January), so there will be plenty of humus in this area. Arsenic was applied to the vegetation on several of these plots, previous to the first ploughing, in September; and it was interesting in following the plough, this second time, to observe that there was a noticeable decrease of the grubs on the poisoned areas.

DISTRIBUTION OF GRUBS AT GREENHILLS.

The relation of feeding trees to distribution of grubs is well illustrated on a large estate like Greenhills. The centre of the estate suffers little, if at all, from infestation; while the fields bordering the forest or scrub are often almost a total loss. These observations are further borne out in following the plough in various parts of the estate. Very few grubs are turned up in the central fields, while they become exceedingly numerous on the edges of the plantation.

INSECT ENEMIES OF CANE GRUBS.

With further reference to the question of digger-wasp parasites—alluded to last month—it will be of interest to mention a few facts respecting the economy of *Dielis formosus*, which, although a well-known species, has not hitherto been bred artificially from the egg, or, indeed, closely studied during the earlier stages of its life.

The female of this handsome digger-wasp, which measures about an inch in length, is mostly black, but ornamented on the abdomen or hind body with three conspicuous broad bands of bright orange colour.

A specimen captured in a canefield last December lived fifty days in confinement at our insectary, during which period it deposited no less than 65 eggs on grubs of the cane beetle (*Lepidiota frenchi*). It may, however, have laid a number of eggs before being caught by us.

Its mode of ovipositing is similar to that adopted by the digger-wasp (*Camsomeris radula*). The white, slightly curved egg is about an eighth of an inch in length, elongate-cylindrical, one of its rounded ends being glued to the under surface of the third abdominal segment of the grub near the legs, in such manner as to project at right angles from the body.

After an interval of three days, the young maggot ruptures the free or head-end of the egg, and remaining inside the attached shell or chorion bends downwards until able to reach the skin of the paralysed host, through which the head is then inserted preparatory to sucking its internal juices.

The average period occupied by the larval stage of *D. formosus* during midsummer is less than eight days (7.75); and about five weeks are passed in the cocoon before the wasp emerges.

The percentage of male and female specimens derived from the sixty-five eggs already mentioned was about equal, and, although maggots producing the latter sex are much the larger, they develop more rapidly, and therefore mature as quickly as those of the male wasps.

About 8 per cent. of grubs used in this experiment died prematurely, owing possibly to having been stung too severely, or perhaps sustained minor injuries when collected in the field. In such cases the parasites, of course, were unable to mature.

Fully 20 per cent. of the eggs were destroyed by a species of mite that very often occurs as a predaceous enemy on the bodies of soil-frequenting white grubs. In a few cases we found that an obscure disease (not yet determined) had destroyed the egg; while in some instances it had been rubbed off by the legs of the insufficiently paralysed grub.

In view of the fact that the entire life-cycle of this digger-wasp is completed in less than two months, and that within a week after emerging from the cocoon the female continues its useful work, it appears highly probable that at least four, if not more, generations may occur annually. We assume such activity to be possible on account of the insect in question being parasitic upon five species of scarabæid cane grubs, two of which frequent the soil for periods of from five to six months; while the others, including *Lepidiota frenchi,* pass at least a year in the larval state. It follows, therefore, that this parasite need never be at a loss for a suitable host on which to oviposit.

Adverse climatic conditions, such as excessive wet or low temperatures, would, however, doubtless operate at times as natural checks to its increase.

Whilst dealing with this subject we may mention, as an interesting fact, that our breeding experiments this month have demonstrated that unfertilised females of the digger-wasp (*Camsomeris radula*) will commence oviposition four days subsequent to emergence from the cocoon; and that such unfertilised ova hatch in a normal manner and produce wasps of both sexes.

ADDITIONAL CANE BEETLES.

About the beginning of January specimens of a beetle together with various grubs obtained from canefields in the Gin Gin district were sent to this office by Mr. H. T. Easterby for identification. The beetles, which happened to be new to our collection, proved to be a cockchafer closely related to root-eating scarabæidæ affecting cane; while the grubs included three kinds, the largest form being a species of *Lepidiota* not occurring in the Cairns district, and the remainder representing the general *Isodon* and *Haplonycha.*

A NEW CANE PEST.

A species of bag-moth (Family, Psychidæ) not hitherto recorded as being injurious to cane is sometimes noticed in plantations around Gordonvale, where it occasions minor damage to the leaf-blade resembling that due to grasshopper injury.

The caterpillar of this species constructs as a protection a tough elongate bag of silk, covering it at first with minute woody fragments, and finally when about an inch and a-half long adding a number of slender sticks of varying length, which being attached at one end project on all sides from the surface at acute angles, near the mouth-end of the bag. Specimens of these curious case-moths are being bred at the insectary, in order that the species may be identified.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following further report upon Cane Grub Investigation from the Entomologist, Dr. J. F. Illingworth:—

Though we had light showers at the beginning of the month (6th to 8th), we are still suffering from drought; and late planting is eliminated.

Dry conditions have been favourable, however, for cane harvesting, the per cent. of c.c.s. remaining high. On the other hand, late in the season, practically all cane in this district is burned before cutting; hence I experienced considerable difficulty in getting mine off green. This I was particularly anxious to do, since I desired exact figures for the crop from the various plots. Though there has been much delay, due to labour difficulties, the cane is finally harvested; and the results are most interesting and valuable. These results could not have been secured had I not had the cordial co-operation of the officers of the Mulgrave Mill.

RESULTS FROM THE MERINGA EXPERIMENTAL PLOTS.

In considering the following results, it must be noted that the drought which we have experienced during the past season made it exceedingly difficult to produce a crop on these dry, red volcanic lands. The experimental block is located at the highest point on the hill, so that it is well drained, and suffers most during drought. As a consequence, the cane which was planted in April, 1918, grew very little until December—in fact, the plants were very dry and almost dead in places in November before the rains started. This condition necessitated long-continued cultivation, which was given to all the plots and extended right through the flight of the beetles to the end of January. As stated in my last report, undoubtedly this cultivation was a most important factor in the control of the grubs for even the check plots produced fair crops.

From the time that the grubs began to be evident, in March, the value of arsenic has been noticeable in the treated plots; and injury was so apparent in the plots where meatworks manure had been applied as to suggest that this fertiliser is very attractive to the pest. At the same time there was no apparent value from the use of sulphate of ammonia. This result is probably due to the fact that the fertiliser was applied too early—fully three months before the rains began in December. Nitrate of soda, however, applied at the same time showed considerable stimulus on the cane. These facts will be further emphasised in the following summary, which indicates the treatment of the several plots, and gives the tons of cane per acre, followed by the average per cent. of c.c.s. for each plot:—

SUMMARY OF THE CROP.

Block.	Tons Cane per acre.	Per cent. c.c.c.
1. Beans sprayed with sodium arsenite, September, 1917, using arsenic at the rate of 20 lb. per acre	23.463	15.06
2. Sodium arsenite sprayed in drill near plants, May, 1918, using arsenic at the rate of 10 lb.	18.076	15.31
3. Sodium arsenite sprayed on weeds, September, 1917, using arsenic at the rate of 10 lb. before ploughing, 2 cwt. sulphate of ammonia applied August, 1918, when cane was waist-high	16.658	15.74
4. Meatworks manure applied August, 1918, at the rate of 5 cwt. per acre	19.890	13.83
5. Nitrate of soda applied at the rate of 2 cwt. per acre, August, 1918	22.758	15.86
6. Same treatment as Block 5, with meatworks manure added at the rate of 5 cwt.	17.955	15.39
7. Beans sprayed with arsenate of lead at the rate of 10 lb. per acre, September, 1917	25.914	14.10
8. Meatworks manure, at the rate of 5 cwt. per acre, mixed with 20 lb. white arsenic, placed in drill on plants, May, 1918	24.849	14.76
9. Arsenate of lead sprayed on weeds, at the rate of 10 lb. before ploughing, September, 1917	22.484	15.30
10. White arsenic at the rate of 10 lb. per acre, dusted on wet beans, September, 1917, before ploughing ..	29.400	13.70
11. White arsenic, at the rate of 10 lb. per acre, placed in drill with plants, May, 1918	25.024	14.25
12. Meatworks manure, at the rate of 5 cwt. per acre, with 10 lb. white arsenic placed in drill with plants, May, 1918	18.960	14.39
13. Beans, with no special treatment except cultivation	21.840	14.92
14. Lime (CaO) applied at the rate of 1 ton per acre, October, 1917, before ploughing	19.959	15.17
15. Check, no treatment except thorough cultivation ..	15.206	14.62

As is well recognised by every agriculturist, it is a very difficult matter to select a field so that all the plots will have the same soil and other natural advantages. In every case this must be taken into consideration in comparing results. There are so many factors affecting the growth of a crop that one cannot be too careful in a study of their relationships. By comparing results of the plots in every possible way, as indicated below, I have arrived at the approximate value of each of the cultural factors of grub control, other than cultivation, expressed in tons per acre:—

SHOWING VALUE OF THE VARIOUS TREATMENTS.

	Tons.
Meatworks manure, 5 cwt. per acre.	
Comparing Blocks 5 and 6, decrease	4.803
Comparing Blocks 11 and 12, decrease	6.064
Average loss due to application of this fertiliser	5.433
Mauritius beans, 2 crops, ploughed in.	
Comparing Blocks 13 and 15, increase	6.634
Comparing Blocks 10 and 11, increase	4.376
Comparing Blocks 1 and 2, increase	5.387
Average increase due to the beans	5.465
White arsenic, 10 lb. per acre.	
Comparing Blocks 11 and 15, increase	9.818
Comparing Blocks 10 and 15, increase	8.729
Comparing Blocks 10 and 13, increase	7.560
Average increase due to this treatment	8.702
Lead arsenite, 10 lb. per acre.	
Comparing Blocks 7 and 13, increase	4.074
Comparing Blocks 9 and 15, increase	7.278
Average increase due to this treatment	5.676
Sodium arsenite (Solution), 10 lb. arsenic per acre.	
Comparing Blocks 2 and 15, increase	2.870
Comparing Blocks 1 and 13, increase	1.623
Average increase due to this treatment	2.246
Nitrate of soda, 2 cwt. per acre.	
Comparing Blocks 6 and 15, increase	8.182
Comparing Blocks 5 and 15, increase	7.552
Average increase due to this treatment	7.867
Lime (CaO), 1 ton per acre.	
Comparing Blocks 14 and 15, increase	4.753
Sulphate of ammonia, 2 cwt. per acre.	
No noticeable result, because applied too early.	

Using these values, I went over the figures for the various plots, comparing them with the check, No. 15, and found them conservative.

GENERAL CONCLUSIONS.

Most surprising, meatworks manure appears to be very detrimental to this type of grub-infested soils. Not only the cost of the fertiliser and its application, but more important is the material decrease in the crop. This evidently is explained by the fact that the manure is attractive to the pest.

The relative value of the various forms of arsenic is also important, and it is interesting to know that the common white arsenic (arsenious acid), which is cheapest and most easily applied, is the most effective.

Apparently it is not wise to apply sulphate of ammonia until after the rains begin. These results, however, should not be taken as indicating that this fertiliser is not valuable for cane, for I have often seen most remarkable stimulus from its use when properly applied. We should recognise, moreover, that this is a home product, and by proper handling it has even a higher nitrogen value than the imported nitrate of soda. In any case, best results are secured on land which has had a dressing of lime (calcium carbonate preferably), but the two should not be applied at the same time.

Nitrate of soda, on the other hand, is apparently not so easily decomposed, and was not wasted during the long delay experienced before rains fell; and the results on the crop are apparent.

The value of the green crop on these soils is also very noticeable, for they are poor in both humus and nitrogen, which are supplied by the beans.

Lime, too, gave evident results, which doubled the money put into its application.

General Notes.

COTTON SEED MEAL.

Cotton-seed meal is one of the richest and most valuable cattle food-stuffs. Its food value exceeds that of maize meal by 62 per cent., and wheat meal by 67 per cent.

The following is an average analysis of samples of cotton-seed meal:—

Water	7.80
Fat	9.31
Protein (albuminoids, &c.)*	42.00
Nitrogen free extract (carbohydrates, &c.) ..	27.83
Fibre	7.18
Ash†‡	5.88

Cotton-seed is also a valuable manure, chiefly on account of its richness in nitrogen, but it is far more economical to feed it to cattle, when 80 per cent. of its manurial value is recovered in the dung.

THE FEEDING VALUE OF COTTON-SEED PRODUCTS.

Under this a large amount of information has been brought together on the results of feeding experiments with cotton-seed produced in the United States and in England.

"Raw cotton-seed cannot be successfully fed to animals, as the lint and dust render it injurious, and it is too rich. It appears to be especially injurious to pigs." So wrote Professor J. P. d'Albuquerque, of the United States Department of Agriculture in 1896.

Experiments in Queensland have not borne out this condemnation of raw cotton-seed as a stock food.

Cotton-seed meal mixed with hulls is employed in enormous quantities in the United States in the fattening of cattle, and can be fed to cattle, sheep, horses, mules, and poultry. As an instance of the kind of results obtained at Woburn, England, it was found that, with fattening bullocks, a mixture of equal parts of cotton-seed cake (cotton-seed meal) and maize meal produced a larger increase in live weight and at less cost than linseed cake.

There can be no doubt that cotton-seed meal, mixed with molasses, and fed in addition to the usual green fodders, would form a valuable aid in rendering sugar plantations self-supporting.

Cotton is a crop well worth growing, seeing that it supplies not only marketable commodities—namely, cotton fibre and cotton-seed oil, for which there exists an enormous demand—but also residues of considerable value as cattle foodstuffs.

We have no oil mills in Queensland for either cotton, castor bean, linseed, olives, or other oil-producing plants such as peanuts; yet all these and many more plants of a like nature thrive in this favoured climate. In order to keep a small central oil factory employed for 100 days, it would be necessary that an area of 6,000 acres should be under cotton cultivation.

SOCIETIES, SHOW DATES, ETC.

MARYBOROUGH.—Wide Bay and Burnett Pastoral and Agricultural Society. The dates for the 1920 Exhibition of the above Society have been fixed for the 9th, 10th, and 11th June.

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* Containing nitrogen=6.72.

† Containing phosphoric acid=2.42.

‡ Containing potash=1.95.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER, 1919.

Article.		DECEMBER.
		Prices.
Bacon	lb.	11½d.
Barley	bush.	5s. 3d. to 5s. 6d.
Bran	ton	£10 to £11 15s.
Broom Millet	„	£40 to £58
Broom Millet (Sydney)	„	£60 to £70
Butter (First Grade)	cwt.	188s. 8d.
Chaff, Lucerne	„	£21 to £24 10s.
Chaff, Mixed	„	£15
Chaff, Oaten	„	£14 15s. to £15 15s.
Chaff, Wheaten	„	£14 to £16
Cheese	lb.	11d.
Flour	ton	£13
Hams	lb.	1s. 10d.
Hay, Lucerne	ton	£16 to £19
Hay, Oaten	„	£17 10s. to £17 15s.
Honey	lb.	6¾d. to 7½d.
Maize	bush.	8s. 1d. to 9s. 6d.
Oats	„	6s. 3d. to 6s. 6d.
Onions	ton	£10 to £15
Peanuts	lb.	7d. to 10d.
Pollard	ton	£10 15s.
Potatoes	„	£35 to £40
Potatoes (Sweet)	cwt.	9s. to 11s.
Pumpkins (Cattle)	ton	£10 to £18 6s.
Eggs	doz.	1s. 7d. to 1s. 11½d.
Fowls	per pair	4s. 5d. to 10s. 6d.
Ducks, English	„	5s. 6d. to 6s. 6d.
Ducks, Muscovy	„	7s. to 17s.
Geese	„	9s. to 14s. 6d.
Turkeys (Hens)	„	15s. 3d. to 33s.
Turkeys (Gobblers)	„	39s. to 80s.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	5s. to 17s. 6d.
Beans, per sugar-bag	4s. to 16s. 9d.
Beetroot, per dozen bunches	1s. to 2s.
Cabbages, per dozen	5d. to 18s. 6d.
Carrots, per dozen bunches	9d. to 1s.
Celery, per bundle	...
Cucumbers, per quarter-case	1s. 3d. to 2s.
Lettuce, per dozen	6d. to 1s.
Marrows, per dozen	3s. 6d. to 11s.
Peas, per sugar-bag	10s. to 17s. 6d.
Potatoes (Sweet), per cwt.	9s. to 11s.
Pumpkins (table), per sack	8s. to 23s.
Tomatoes, per quarter-case	2s. 6d. to 11s. 6d.
Turnips, per doz. bunches	3s. to 4s.
Turnips (Swede), per ton	£8 10s. to £11 10s.

SOUTHERN FRUIT MARKETS.

Article.	DECEMBER.
	Prices.
Bananas (Queensland), per double-case	18s. to 25s.
Bananas (Tweed River), per double-case	20s. to 25s.
Bananas (Fiji), per case	22s.
Lemons, per bushel-case	25s. to 27s. 6d.
Oranges, per bushel-case	14s. to 22s.
Oranges (Navel), per bushel-case	22s. to 25s.
Passion Fruit, per double-case	22s.
Pineapples (Queens), per double-case	18s. to 20s.
Pineapples (Ripleys), per double-case	12s. to 20s.
Pineapples (Common), per double-case	10s. to 15s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	15s. to 27s. 6d.
Apples, Cooking, per bushel-case	9s. to 20s.
Bananas (Cavendish), per dozen	8d. to 1s.
Bananas (Sugar), per dozen	5½d. to 6¾d.
Cherries, per tray	12s. to 15s.
Citrons, per cwt.	9s. to 14s.
Cocoanuts, per sack	15s. to 25s.
Grapes, per lb.	1s. 5d. to 1s. 10d.
Lemons (Lisbon), per half-case	8s. to 24s.
Lemons (Rough), per cwt.	14s.
Limes, per half bushel-case	15s. to 16s. 6d.
Mangoes, per case	5s. 6d. to 11s. 6d.
Oranges, per case	5s. 6d. to 25s.
Papaw Apples, per quarter-case	1s. 9d. to 3s. 6d.
Peaches, per quarter-case	4s. to 12s.
Pineapples (Rough), per case	8s. to 16s.
Pineapples (Smooth), per case	10s. to 15s.
Pineapples (Ripley), per case	14s. to 16s.
Rock melons, per dozen	2s. to 12s.
Strawberries, per dozen pint-boxes	4s. to 6s.
Tomatoes (prime), per quarter-case	2s. 6d. to 5s. 6d.
Tomatoes (inferior), per quarter-case	2s. to 4s.
Water melons, per dozen	6s. to 25s.

TOP PRICES, ENOGGERA YARDS, NOVEMBER, 1919.

Animal.	NOVEMBER.
	Prices.
Bullocks	£22 to £26 5s.
Bullocks (single)	£32 10s.
Cows	£19 17s. 6d to £22 2s. 6d.
Cows (single)	£26 5s.
Merino Wethers	43s.
Crossbred Wethers	42s. 6d.
Merino Ewes	33s.
Crossbred Ewes	43s.
Lambs	35s. 6d.
Pigs (Bacon)	£4 18s. 6d.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·59	5·46
2	4·58	6·46	5·22	6·42	5·42	6·18	5·59	5·44
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·43
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·42
5	5·0	6·46	5·24	6·40	5·44	6·15	6·1	5·41
6	5·1	6·47	5·25	6·39	5·45	6·14	6·1	5·40
7	5·2	6·47	5·26	6·39	5·45	6·13	6·2	5·39
8	5·2	6·47	5·27	6·38	5·46	6·12	6·2	5·38
9	5·3	6·47	5·28	6·37	5·46	6·11	6·3	5·37
10	5·3	6·47	5·28	6·36	5·47	6·10	6·3	5·36
11	5·4	6·47	5·29	6·36	5·48	6·9	6·4	5·35
12	5·5	6·47	5·30	6·35	5·48	6·8	6·4	5·35
13	5·6	6·47	5·31	6·35	5·49	6·7	6·4	5·34
14	5·6	6·47	5·31	6·34	5·49	6·6	6·5	5·33
15	5·7	6·47	5·32	6·33	5·50	6·5	6·5	5·32
16	5·8	6·47	5·33	6·32	5·50	6·4	6·6	5·31
17	5·9	6·47	5·33	6·31	5·51	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·51	6·2	6·7	5·29
19	5·10	6·47	5·35	6·29	5·52	6·1	6·7	5·28
20	5·11	6·47	5·35	6·28	5·52	6·0	6·8	5·27
21	5·12	6·46	5·36	6·28	5·53	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·53	5·58	6·9	5·25
23	5·14	6·46	5·37	6·26	5·54	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·54	5·56	6·10	5·23
25	5·16	6·45	5·38	6·24	5·55	5·55	6·10	5·22
26	5·16	6·45	5·39	6·23	5·56	5·53	6·11	5·21
27	5·17	6·44	5·40	6·22	5·56	5·52	6·11	5·20
28	5·18	6·44	5·41	6·21	5·57	5·50	6·12	5·19
29	5·19	6·43	5·41	6·20	5·57	5·49	6·12	5·18
30	5·20	6·43	...	...	5·58	5·48	6·13	5·18
31	5·21	6·42	...	...	5·58	5·47	...	...

PHASES OF THE MOON.

The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical.

			H.	M.
6 Jan.	○	Full Moon	7	5 a.m.
13 „	☽	Last Quarter	10	9 a.m.
21 „	●	New Moon	3	27 p.m.
29 „	☾	First Quarter	1	38 a.m.

Perigee on 5th, Apogee on 17th. (An occultation of the planet Venus by the Moon will take place on the 17th. Unfortunately not visible in Australia.)

4 Feb.	○	Full Moon	6	42 p.m.
12 „	☽	Last Quarter	6	49 a.m.
20 „	●	New Moon	7	35 a.m.
27 „	☾	First Quarter	9	50 a.m.

Perigee on 2nd and 28th, Apogee on 13th

5 Mar.	○	Full Moon	7	13 a.m.
13 „	☽	Last Quarter	3	57 a.m.
20 „	●	New Moon	8	56 p.m.
27 „	☾	First Quarter	4	45 p.m.

Apogee on 12th, Perigee on 24th.

3 Apr.	○	Full Moon	8	55 p.m.
11 „	☽	Last Quarter	11	24 p.m.
19 „	●	New Moon	7	43 a.m.
25 „	☾	First Quarter	11	28 p.m.

Apogee on 9th, Perigee on 21st.

There will be no eclipse of the Sun o Moon till May 3rd.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1919.	Nov., 1918.
North Coast.	In.		In.	In.
Atherton	2·33	18	0·53	1·82
Cairns	4·20	37	2·26	2·67
Cardwell	4·30	47	1·08	1·73
Cooktown	2·90	43	0·37	0·78
Herberton	2·53	32	0·61	3·77
Ingham	4·12	27	1·27	3·04
Innisfail	6·66	38	1·23	12·34
Mossman	5·08	11	2·52	5·86
Townsville	1·94	48	0·16	2·48
Central Coast.				
Ayr	1·81	32	1·05	1·20
Bowen	1·36	48	0·53	0·95
Charters Towers ...	1·70	37	0·04	4·09
Mackay	3·00	18	1·47	2·64
Proserpine	3·30	16	2·27	1·51
St. Lawrence ...	2·44	48	0·61	5·09
South Coast.				
Biggenden	2·86	20	Nil	1·17
Bundaberg	2·69	36	0·63	1·46
Brisbane	3·66	68	0·38	2·16
Childers	2·93	24	0·12	2·12
Crohamhurst ...	4·51	26	0·58	0·97
Esk	3·18	32	1·09	2·92
Gayndah	2·89	48	0·33	1·75
Gympie	3·19	49	0·05	1·36
Glasshouse M'tains	3·94	11	0·04	0·58
Kilkivan	2·56	40	Nil	0·74
Maryborough ...	3·17	48	0·08	0·24
South Coast—continued:	In.		In.	In.
Nambour	3·88	23	0·30	1·57
Nanango	2·65	37	0·65	1·07
Rockhampton ...	2·19	32	0·63	0·83
Woodford	3·17	32	0·50	0·72
Darling Downs.				
Dalby	2·59	49	0·48	0·31
Emu Vale	2·49	23	3·46	0·19
Jimbour	2·45	31	0·41	0·06
Miles	2·60	34	0·82	0·47
Stanthorpe ...	2·78	46	0·48	1·57
Toowoomba ...	3·29	47	0·77	0·32
Warwick	2·57	32	2·40	0·33
Maranoa.				
Roma	2·13	45	0·38	1·26
State Farms, &c.				
Bungeworgorai ...	2·53	5	0·53	1·52
Gatton College ...	2·77	20	0·65	1·83
Gindie	...	...	0.27	3·12
Hermitage ...	2·58	13	1·49	1·08
Kairi	3·09	5	0·40	1·38
Sugar Experiment Station, Mackay	2·76	22	1·28	2·63
Warren	3·73	5	0·55	0·60

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kafir corn, imphee, sorghum, and vetches may be sown; but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop, sow swede turnips and mangelwurtzels. Pick cotton as the bolls burst. Do not pick until the dew has dried off the bolls. Expose the picked cotton for a couple of hours to sun heat.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes, so that the compound shall contain—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. In the pamphlet on "Market Gardening" issued by the Department, it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, and are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, French and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, pentstemons, &c. Dianthus, sown now and planted out in March, will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size; for instance, a pea is about one-eighth of an inch in diameter, therefore, cover it with one-eighth of an inch of soil.

Orchard Notes for February.

In order that the series of monthly notes that have appeared for some years past in the "Agricultural Journal" might be rendered of more value to our fruitgrowers, advantage was taken of the commencement of the new year to revise them and bring them up to date. At the same time, the notes have been somewhat altered, as, instead of making them of a general nature, applicable to the whole of the State, they are, to a certain extent, localised, as, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea the State has been divided as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn;
2. The Tropical Coast Districts;
3. The Southern and Central Tablelands.

This plan has met with such general approval during the past year that the notes will henceforth be published in accordance therewith.

THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pineapples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries, and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is thoroughly prepared—viz., well and deeply worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that when ploughed in later on will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture, as well as to increase its nitrogen contents.

This is the best month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion, when placed in position, must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into the scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded it may be continued during the month, as fruit treated now will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand and also for the Yellow Peach Moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but March is to be preferred. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut where necessary, and the young trees trained to a straight single stem.

THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water-shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree, and thus injure it considerably. Many of the citrus trees will come into a second blossoming during the month, and this will produce a crop of fruit ripening towards the end of wnter and during the following spring. The main crop, where same has set in spring, will be ripening towards the end of the month, but as a rule insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet it should be artificially dried before packing; but if there are periods of sunshine, then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit, or to dry it too much; all that is required is to evaporate the surplus moisture from the skin, so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

THE SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit-fly and codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or codling moth infested fruit leaves the district. The grapes, ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane, but to all other parts of the

State. For long shipment nothing can beat crates holding 6-lb. baskets. The fruit should be gathered some hours before packing, and be placed in the sun, so as to become thoroughly dry, and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with those pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, when infested by Red Scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain, but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry the trees on till the fruit is ripe.

WHY DAFFODILS DON'T GROW.

By A. JAMIESON, Park Town, Johannesburg.

Now that the daffodil flowering season is over a few notes as to their treatment should not come amiss, as I find that most people make the great mistake of neglecting their bulbs after the flowering period, leaving them to look after themselves till the foliage dies down. This to my mind is a great mistake, as this is really the time they should be taken great care of; and before allowing the bulbs to dry up they should receive copious supplies of liquid manure at least twice a week, only discontinuing this treatment when the foliage shows unmistakable signs of going to rest. I never disturb my bulbs till the foliage has entirely died down. Then lift and store the bulbs in a cool place till you require to pot them again, if for stoep decoration; or plant in beds, if for cut flowers. I find they are not satisfactory subjects for the mixed border, as exposed to full sun they last a very short time in bloom; so it pays one to give them a spot in the garden which enjoys partial shade during the hottest part of the day, for hot sun destroys the flowers sooner than frost or wind. In England, and I should think at the Cape, they are well adapted to plant in the grass, or naturalise by the side of woodland walks or in shrub borders; and clumps planted thus can remain a long time, where they will increase in size and flower with greater profusion year after year.

LIFT AND STORE EACH YEAR.

On the High Veld they require different treatment, for if left in the ground the bulbs shrivel up and disappear altogether. They should be lifted and stored every year about November or December. Great care must be taken not to allow the bulbs to shrivel up when stored away. I usually replant about the first week in March, and make several plantations, the last of which should not be later than the last week in April. The soil used should be light and rich, though they are not very exacting as regards soil. A mixture of black soil and drift sand with well-rotted cow manure and a good dash of bone meal added suits them very well indeed. The bulbs should be planted about 4 in. deep, the base of the bulbs resting on a little sand. After finishing planting, give a good soaking of water; but care must be taken not to give too much water till growth starts, when they require careful attention as regards watering, never allowing them to become dry, as this often spells success or failure and is the cause of so many complaints about daffodil bulbs not flowering. The two periods just before and after flowering are the most critical in the life of the daffodil as regards watering and attention. The modern development of the daffodil has elevated it to the rank of the carnation and the sweet pea; and the ever-increasing new sorts bring gladness to the hearts of enthusiasts, but to the ordinary grower, especially those with limited space, it brings the problem of "Which varieties will I have most success with and find room for without expelling older sorts that are still good?" If I were asked to say what I thought were absolutely the best and most free blooming varieties to grow and most suitable for our climate, Sir Watkin, the largest in the Incomparabilis section, takes first place; next *Barri Conspicuus*, a remarkable flower of great beauty and too well known to require description. Among the large trumpets, Emperor, Golden Spur, and Henry Irvin are my favourites. The two coloured trumpets (bicolours) of the type of Empress and Horsefieldii also do well and flower freely. For those who seek fine yellow trumpets of modern interest, I know of no better daffodil than Golden Bell. This is the first year I have grown this variety, but I am more than satisfied with the results, as it responds to fair treatment and repays you with a wealth of rich coloured flowers which last a long time when cut. The foregoing varieties are those that do best with me, but it is far from exhausting the good sorts that can be well grown in this country, as those who study South African gardening will see by reading the report on the Daffodil Show held at the Cape this past spring.—"South African Gardening."

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

DODDER.

All lucerne-growers in Queensland know this pernicious weed, but it has not yet been included in a noxious weeds Act, except perhaps in the Local Authorities Act. In South Australia, a proclamation appeared in the *Government Gazette* of 18th September last year declaring "the following weed (Dodder—*Cuscuta*) to be a noxious weed, and to be included in the Thistle and Burr Act of 1862." In the "Journal of Agriculture of South Australia" for December, 1919, Mr. H. W. Andrew, Botanical Assistant, writes on this pest as follows:—

There are 90 or more tropical and temperate species of *Cuscuta*, a number of which have been distributed throughout the world by means of impure agricultural seed. They belong to the convolvulus or bind-weed family, and are practically leafless and rootless, with no chlorophyll. Among the species most injurious to agriculture are *Cuscuta europea*, L.; *C. epilinum*, Weihe, Flax Dodder; *C. trifolii*, Bab., *C. epithymum*, Murr., Clover Dodder; and *C. arvensis*, Field Dodder. Specimens of the two last-mentioned species infesting lucerne crops have been submitted to the department during the past four or five years.

Most dodders are annuals, and have practically the same development. Each flower normally produces four seeds, and these contain a thread-like spirally coiled embryo. On germinating on the surface of the ground, this grows in a peculiar manner, assuming somewhat the shape of a corkscrew. Unless the seedling soon finds a suitable host plant, it falls to the ground, being unable to obtain food from the soil and air like green plants do. Here it may lie dormant "waiting for something to turn up," but, if it fail to come into contact with a suitable host, will eventually die. On the other hand, should the dodder seedling reach such a host (which it has every chance of doing when dodder-infested seed is sown) it twines itself around the stem of the latter, and its tissues unite with those of its host by means of suckers or *haustoria*. The parasite now loses its connection with the ground, and rapidly extends its thread-like branches (often reddish or yellow) to adjoining host plants. Depending as they do entirely on the host plant for all food, these absolute parasites are very destructive, and may leave the infested area as though a fire had swept over them.

CONTROL.—PREVENTION.

Efficient control of seed supplies is considered the world over to be the successful means of restricting the distribution of these parasitical weeds. All species of *Cuscuta* are proclaimed weed pests under the Commonwealth Quarantine Act, and clover, lucerne, and other crop seeds containing seeds of dodder from oversea countries are refused admission into South Australia. There is no inspection of such seeds, however, from the other States, though this anomaly will receive consideration in connection with the State Seed Control Bill which the Government have announced their intention of introducing. Where possible, farmers and others purchasing lucerne and clover seeds should send samples of at least 1 oz. or, better, 2 oz. to the department, to have them tested for impurities and germination, for which no charge is made.

EXTERMINATION.

The method of exterminating dodder when once established in a crop depends a good deal on the kind of crop infested, whether annual or perennial; also whether the dodder has seeded before being attacked, &c. Cutting the affected patch and a margin for safety close down (say, with a spade), and afterwards heaping chaff or straw over it and then burning on the spot is recommended. Spraying affected clover with a 15 per cent. solution of sulphate of iron is frequently practised in the northern hemisphere, and, it is claimed, kills the dodder and only injures the clover temporarily. Such infested spots, after burning, are sometimes surrounded by a trench, the soil from which is thrown over the patch, so as to cover it several inches, so restricting the possibility of dodder seedlings which may sprout subsequently breaking through.

As dodder seed may retain its vitality in the soil for several years, a number of examinations should be made of a young growing crop of lucerne or clover for the presence of this serious pest, so as to be in a position to attack it before the seedling stage. Even if found before the seeding stage is reached, it should be burnt on the spot, as the thread-like branches propagate themselves as cuttings.

The so-called ''scrub dodders'' or ''wait awhile'' (*Cassytha,* spp.) of Australia are not true dodders or cuscutas, though, like them, depend on their hosts for all nutriment. They do not attack agricultural herbaceous crops. They belong to the laurel family.

HEREFORD CATTLE.

In an article dealing with the foundation and short history of this breed, the ''Pastoral Review'' says:—

''Natural aptitude to fatten and early maturity are, perhaps, the predominating characteristics of the breed, and they have always been most carefully maintained and developed. The cattle are extremely hardy, and no breed is less susceptible to the terrible scourge of tuberculosis. Hereford cows are splendid mothers, rearing their calves well and maintaining their own condition at the same time. They have exceptionally long lives as breeders. Dropping their first calf usually at about three years of age, they continue breeding up to fourteen and fifteen years. The Hereford bull is a most prepotent sire. Whether crossed with pedigree or mongrel, he invariably transmits to his progeny his own wonderful qualities and characteristics. In addition, the experience of ranchers has proved that, owing to his activity, where a Hereford is used, fewer stock bulls are required. The use of a Hereford bull ensures a high percentage in the calf crop, an immediate gathering up of the stock in which the characteristics of the sire are unmistakeably evident, and, owing to the hardiness of the breed, a large proportion of calves at branding time. They are essentially a beef breed, but when bred for the purpose they prove excellent milkers, the percentage of butterfat being exceptionally high.''

Pastoral.

LIVE AND DEAD WEIGHTS OF CATTLE.

The "Farmers' Weekly" (South Africa) has the following article on the carcass yield of cattle:—

The term "carcass yield" means the ratio of the dressed carcass, when prepared for market, to the live weight of the animal. Naturally this varies materially according to breed, age, and condition at time of slaughter; but it may be said in general terms that cattle will average about 55 per cent., sheep about 50, and pigs 78 per cent.

The dressing percentage is an important factor in determining the price received for the animal on foot. Often the animal that is purchased for the lowest figure yields the most expensive beef. In this case the word "expensive" is not synonymous with "high quality." It means that the percentage of waste is so great that the first cost of the saleable parts is in consequence high.

The following table gives a fair idea as to the dressing loss in an average bullock of 1,200 lb. weight:—

	Weight. Lb.	Per Cent. of Live Weight.
Head	32	2.16
Feet	19	1.58
Pluck	26	2.17
Liver	13	1.08
Tongue	3	0.25
Tail	14	1.12
Intestines	36	3.00
Blood and paunch contents	225	18.75
Paunch	32	2.66
Intestinal fat	28	2.33
Hide	75	6.25

The value of a beef carcass depends upon its condition, form, and percentage of high-priced cuts. The relative percentages of weight and value on the market of the wholesale cuts of beef are illustrated by the following table:—

Cuts.	Average per Cent. Weight.	Average per Cent. Value.
Loin	17	33.66
Ribs	9	15.47
Round	23	19.67
Chuck	13	18.30
Plate	13	9.13
Flank	4	0.89
Front shank	4	1.49
Suet	4	1.19

These figures explain why so much importance is attached to loin and rib development in a fat beast. Obviously, the more meat that can be crowded into the higher valued parts the more profitably will the carcass cut up.

It is stated that a choice or prime carcass can be left hanging in the cool chamber longer than that of an inferior animal. A thin carcass loses more in weight than a well-finished one, owing to the greater evaporation. This loss in weight from warm to cold averages from 1.5 to 2 per cent.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1919.

Considering the adverse weather conditions, the laying generally has been satisfactory. The birds look well, and the majority have that hard appearance so much sought after that usually points to a late moult. The maximum temperature for the month was 109 degrees, and several days registered over 100 degrees. There were seven deaths during the month—one case of tuberculosis, one with ruptured liver, and five cases of heat apoplexy, the latter all occurring on the 15th. Broodies have again been troublesome. The birds have been fortunate in being able to get plenty of green feed. The laying of Burns's D bird still continues good. In spite of the heat, she laid 30 eggs for the month, bringing her score to 252 for nine months. R. Holmes's E bird laid 26 eggs, making her total 246. T. Fanning's score of 145 is the highest for a group for the month. The following are the individual records:—

Competitors.	Breed.	Dec.	Total.
	LIGHT BREEDS.		
*J. M. Manson	White Leghorns	130	1,234
*T. Fanning	Do.	145	1,227
*E. A. Smith	Do.	139	1,155
*W. Hindes	Do.	107	1,145
*Dr. E. C. Jennings	Do.	132	1,109
*Dixie Egg Plant	Do.	111	1,100
*G. W. Hindes	Do.	121	1,070
*Haden Poultry Farm	Do.	107	1,055
Range Poultry Farm	Do.	117	1,055
*Quinn's Post Poultry Farm	Do.	116	1,053
*B. Caswell	Do.	121	1,046
*W. Becker	Do.	124	1,033
*L. G. Innes	Do.	119	1,027
J. H. Jones (Toowoomba)	Do.	118	1,026
*C. P. Buchanan	Do.	114	1,015
*Harold Fraser	Do.	118	1,004
S. McPherson	Do.	107	995
*J. J. Davies	Do.	118	985
*Mrs. L. F. Anderson	Do.	110	969
W. A. Wilson	Do.	117	968
*Mrs. A. G. Kurth	Do.	128	963
*W. Lyell	Do.	124	957
G. Williams	Do.	102	956
G. J. Byrnes	Do.	95	939
*Thos. Taylor	Do.	111	935
S. W. Rooney	Do.	102	927
Geo. Trapp	Do.	112	908
H. A. Jones (Orallo)	Do.	104	904
*Mrs. R. Hunter	Do.	100	902
B. Chester	Do.	103	872
Mrs. M. Charteris	Do.	121	871
*O. W. J. Whitman	Do.	115	871
C. A. Goos	Do.	104	848
G. H. Kettle	Do.	72	848
N. A. Singer	Do.	120	845
J. W. Newton	Do.	118	838
H. O. Jones (Blackstone)	Do.	89	822
Oakleigh Poultry Farm	Do.	95	815
R. C. J. Turner	Do.	93	780
W Morrissey	Do.	89	753
J. H. Dunbar	Anconas	71	723

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec	Total.
	HEAVY BREEDS.		
*R. Holmes	Black Orpingtons	113	1,253
*E. F. Dennis	Do.	131	1,206
*R. Burns	Do.	132	1,189
*E. M. Larsen	Do.	106	1,157
*W. Smith	Do.	109	1,102
*A. E. Walters	Do.	118	1,090
Geo. Nutt	Do.	79	1,036
*E. Morris	Do.	102	1,034
*Kelvin Poultry Farm	Plymouth Rocks	80	1,022
*A. Shanks	Black Orpingtons	87	1,010
*Nobby Poultry Farm	Do.	93	1,003
*T. Hindley	Do.	112	982
*Mars Poultry Farm	Do.	111	957
*Jas. Ferguson	Chinese Langshans	92	939
*D. Fulton	Black Orpingtons	91	928
R. B. Sparrow	Do.	120	928
*W. H. Reilly	Chinese Langshans	82	892
A. Homan	Black Orpingtons	108	874
Burleigh Pens	Do.	94	870
*F. W. Leney	Do.	92	851
*H. Puff	Rhode Island Reds	75	829
J. A. Cornwell	Black Orpingtons	97	799
*T. B. Barker	Do.	76	775
C. H. Singer	Do.	96	771
H. Ashworth	Do.	84	744
A. Gaydon	Do.	92	734
Total	...	7,128	64,523

* Indicates pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	212	196	216	210	194	206	1,234
T. Fanning	211	188	200	215	200	213	1,227
E. A. Smith	189	185	210	190	179	202	1,155
W. Hindes	205	199	193	173	185	191	1,145
Dr. E. C. Jennings	189	162	189	180	179	210	1,109
Dixie Egg Plant	172	185	192	192	172	167	1,100
G. W. Hindes	195	180	193	170	161	171	1,070
Haden Poultry Farm	196	193	179	173	139	175	1,055
Range Poultry Farm	166	181	184	183	158	173	1,055
Quinn's Post Poultry Farm	170	173	181	203	165	161	1,053
B. Caswell	146	120	173	208	224	175	1,046
W. Becker	203	182	193	162	130	163	1,033
L. G. Innes	148	193	145	184	190	167	1,037
C. P. Buchanan	151	195	151	164	165	189	1,015
H. Fraser	140	189	195	174	123	183	1,004
J. J. Davies	154	163	173	172	157	166	985
Mrs. L. F. Anderson	177	188	150	164	138	152	969
Mrs. A. G. Kurth	196	168	169	158	118	154	963
W. Lyell	148	170	181	150	156	152	957
Thos. Taylor	168	130	139	181	182	135	935
Mrs. R. Hunter	144	121	167	153	157	160	902
O. W. J. Whitman	141	173	133	130	153	141	871

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Holmes	212	213	231	187	246	164	1,253
E. F. Dennis	309	181	215	196	178	227	1,206
R. Burns	207	173	192	252	188	172	1,189
E. M. Larsen	196	201	214	174	200	172	1,157
W. Smith	162	198	188	164	204	188	1,102
A. E. Walters	195	160	193	176	175	191	1,090
E. Morris	172	166	183	181	204	128	1,034
Kelvin Poultry Farm	227	150	163	134	186	162	1,022
A. Shanks	86	143	213	170	191	207	1,010
Nobby Poultry Farm	168	144	145	166	187	193	1,003
T. Hindley	178	172	140	184	144	164	982
Mars Poultry Farm	143	197	194	126	120	177	957
Jas. Ferguson	162	209	127	134	155	152	939
D. Fulton	139	156	157	146	169	161	928
W. H. Reilly	133	127	178	169	127	143	892
F. W. Leney	111	136	152	186	123	138	851
H. Puff	165	130	141	164	96	133	829
T. B. Barber	128	135	118	124	146	124	775

CUTHBERT POTTS,
Principal.

POULTRY DISEASE.

"Anxious," Home Hill, Bowen.

Mr. J. Beard, Poultry Instructor, replies to your questions as follows:—Your fowls are apparently suffering from a severe form of "roup." When once this disease makes its appearance, it becomes contagious. It is a common disease, and one of the most deadly that poultry-keepers have to contend against. The disease can be readily transmitted, and may spread through a flock with great rapidity, unless strict preventive measures are taken to check its progress.

TREATMENT.

Examine all your birds carefully, and for any that are badly affected the axe is the best remedy. Quarantine all birds that are only slightly affected, and wash the head and nostrils thoroughly with a weak solution of boracic acid and warm water, using your finger and thumb to squeeze the nostrils out, and clean out the cleft of the top of the mouth with a feather. Then dry thoroughly and apply kerosene to the nostrils and cleft with a feather. This process must be continued until a cure is effected. Disinfect all houses and yards thoroughly with a strong solution of disinfectant.

PREVENTIVE.

Cut a kerosene tin in halves endways, which will give nine inches square of water surface. Supply their drinking water in this, and add one tablespoonful of kerosene twice a week, when the fowls show any signs of roup, and once a week in normal times. This remedy will destroy any nasal or internal disease germs, and is self-applied. Care should, however, be taken that no other water is within reach during the kerosene process.

Dairying.

NOTES ON THE METHYLENE BLUE REDUCTASE TEST.

R. B. TENNENT, N.D.D.

INTRODUCTION.

The study of milk enzymes has of recent years received considerable attention, much valuable work being carried out with a view to obtaining a fuller knowledge and a clearer conception of their various characteristics. Controversy has arisen on many important points concerning their action and effect, but until such points have been clearly established by conclusive experiments, it will be impossible to dogmatise on the subject.

Normal milk, as secreted by the healthy mammary glands of the cow, contains certain enzymes, the most important of these being—

(*a*) Peroxidase.
(*b*) Reductase (indirect).
(*c*) Catalase.
(*d*) Amylase.

That milk contains other proteolytic enzymes, such as lipase (a fat-splitting enzyme) and lactase, is claimed by different observers, but at present the evidence supporting such claims is not sufficiently conclusive to say definitely that such is the case.

The invariable presence of the abovenamed enzymes in milk forms the basis of different tests, and, as they are readily destroyed by heat, advantage is taken of their presence or absence in determining whether milk is raw or pastuerised (Peroxidase test).

It has long been known that if methylene blue be added to milk, the blue colouration produced could be destroyed by incubating the milk for some time, the period required varying considerably with the different samples of milk taken. That this phenomenon is due to bacterial activity is unquestioned, and efforts have been made to utilise it in measuring the bacterial content of milk, but the results have not been satisfactory, owing chiefly to the fact that no standard technique has been adopted, and that too much was hoped for in this test. As a means of determining the exact number and kind of organisms present in milk it is valueless, but as a simple test for obtaining an approximate idea of the general bacterial content, apart from the pathogenicity or otherwise of the organism, it has much to commend it.

HISTORICAL.

The reducing action of bacteria as indicated by the presence of reductase is no new observation. In 1843 Helmholtz in a series of experiments showed that putrefactive changes which were undiscernable by odour could be proved by discolouration of litmus colouring matter, and at a subsequent date his results were confirmed by many authors who proved this reducing action to be an attribute of many aerobic and anaerobic organisms. According to Dupetit and Gayon, the anaerobes are capable of forming ammonia from nitrates, while the *B. prodigiosus* and others form nitrites from nitrates.

Some authors, such as Spina and Wolff, use colouring matter which changes into leuco-compounds, as an agent for demonstrating the reductase process, but they become reoxidised from renewed contact with the atmosphere. The colouring substances used by them are—tincture of litmus, indigo blue, neutral red, thionin, &c. Others again (Kleet, Gosio) use metallic salts, such as selenite and tellunite, to render the reduction directly visible.

REAGENTS.

Shardinger's methylene blue reagent is at the present time most extensively used, and it is prepared by diluting 5 c.c. of a saturated alcoholic solution of methylene blue with 195 c.c. of water. He also recommends another reagent called "F.M.B." (formaldehyde methylene blue), which contains 5 c.c. saturated alcoholic solution of M.B. + 5 c.c. of 40 per cent. formaldehyde + 190 c.c. water. In each case one uses 1 c.c. of the reagent to 20 c.c. of milk heated to 45 degrees C.

The reduction is complete when the blue milk turns white. When the reaction occurs in the absence of aldehyde, it is now termed "direct reductase reaction," and in the presence of aldehyde, the "indirect reductase reaction."

THE TEST.

In making the test a control sample should be used for comparison of colour. After the addition of the reagent to the milk, the length of time elapsing from its addition until the milk turns white should be noted. If this occurs in less than three hours the milk is already "old." Here, however, "age" does not mean the length of time elapsing since the milk was drawn from the udder, but that the milk has "aged." Thus, milk produced under dirty conditions, imperfectly cooled, and transported in badly cleansed cans, "ages" more rapidly than that produced under hygienic conditions.

It is advocated by some that in making the test it is necessary to cover the sample in the reagent glass with boiled oil or kerosene, but there is no advantage in doing so.

A satisfactory method of determining the reduction property of milk is that recommended by Ernst. For each sample of milk ten small tubes are used, containing one, two, three, four, up to ten drops of M.B. solution respectively. Into each tube 5 c.c. of milk is added. After one-quarter, one-half, one, and two hours, &c., observations are made as to what extent the milk has been reduced. This method is quite simple, and eliminates the constant watching of the samples in order to detect the time when the reduction is complete, and by this method both time and degree are determined. If, for instance, a milk is reduced in three hours to tube 8, then the formula will be: R3 = 8. Good milk reduces the first two tubes only after two to three hours; fresh milk only after ten to eighteen hours.

OBSERVATIONS.

The reducing qualities of different organisms towards methylene blue undoubtedly vary. Jensen has carried out considerable researches in this connection, and has shown the reduction qualities of a series of organisms found in milk. He further proved that varieties of the colom group, staphlycocci mould fungi, and sarcina reduce rapidly, whilst *acid streptococci* do not decolourise the solution.

Arranged in order of the length of time, reduction takes place as follows:—

B. fluorescens non-liquefaciens	8 minutes
B. acidi lactici (Hueppe)	12 "
B. prodigiosus	10-15 "
B. fluorescens liquefaciens	13 "
B. coli communis	17 "
B. subtilis	30 "
B. mesentericus vulgatus	60 "
Streptococcus acidi lactici	not in 80 minutes.
Oidium lactis	

From the above table it is obvious that milk contaminated with the excreta of cows or dirty straw, which contain *B. coli communis* and *B. subtilis*, respectively, will take a much longer time to react to the reductase test than milk containing numbers of *B. acidi lactici*.

Milk with a high bacterial content reduces methylene blue solution in a period of time directly in proportion to the numbers and kind present. Milk drawn from the udder in a sterile condition fails to reduce the M.B. even after a few days. According to Müller, freshly drawn and cleanly handled market milk requires ten, twelve, or more hours for reduction (mixing 10 parts to 1 part M.B.), whereas fresh market milk in cold weather requires six to nine hours, and in warm weather one to two hours.

At the end of the incubation period, when the bacteria commence to multiply, the time required for reduction amounts to from one to two hours. The addition to fresh milk of manure or sour milk hastens the time for reduction. Thus factors favouring bacterial growth hasten the reduction.

From the writer's own observations, he found that 10 c.c. of milk containing about 50,000 bacteria per c.c. failed to reduce 1 c.c. of M.B. solution in six hours.

With approximately—

250,000	bacteria,	reduction	took place in	5½	hours
500,000	,,	,,	,,	3½	,,
1,700,000	,,	,,	,,	2½	,,
10,000,000	,,	,,	,,	70	min.
400,000,000	,,	,,	,,	30	,,
700,000,000	,,	,,	,,	15	,,

EFFECT OF ACIDITY.

There exists a direct relationship between the growth of bacteria and the production of lactic acid, the organisms converting lactose into lactic acid; hence there exists a certain connection between the degree of aidity of milk and the rapidity of reduction. Further, since the degree of acidity increases rapidly after the completion of the incubation period, a rapid reduction would be expected to follow the increase in the degree of acidity.

That such is the case has been proved by the experiments of Jensen, who observed that milk which reduced in one minute after twelve hours at 25 degrees C. had a degree of acidity of 36.

Milk reduced in—

5	minutes	after 12 hours	at 25	degrees	had a	degree of	acidity of	..	19
8	,,	,,	,,	,,	,,	,,	,,	..	20
6	,,	,,	,,	,,	,,	,,	,,	..	35
10	,,	,,	,,	,,	,,	,,	,,	..	22
1	hour	,,	,,	,,	,,	,,	,,	..	15
½	,,	,,	,,	,,	,,	,,	,,	..	25.5
1¾	,,	,,	,,	,,	,,	,,	,,	..	11.5
2¼	,,	,,	,,	,,	,,	,,	,,	..	15
3¾	,,	,,	,,	,,	,,	,,	,,	..	
6½	,,	,,	,,	,,	,,	,,	,,	..	
12¼	,,	,,	,,	,,	,,	,,	,,	..	

The writer made observations of the effect of acidity on the length of tim required for reduction of the methylene blue, and his results are similar to those Jensen.

The following table compiled by Ernst shows the results of the techniq employed in testing milk, where the reduction number is understood to mean th

REAGENTS.

Shardinger's methylene blue reagent is at the present time most extensively used, and it is prepared by diluting 5 c.c. of a saturated alcoholic solution of methylene blue with 195 c.c. of water. He also recommends another reagent called "F.M.B." (formaldehyde methylene blue), which contains 5 c.c. saturated alcoholic solution of M.B. + 5 c.c. of 40 per cent. formaldehyde + 190 c.c. water. In each case one uses 1 c.c. of the reagent to 20 c.c. of milk heated to 45 degrees C.

The reduction is complete when the blue milk turns white. When the reaction occurs in the absence of aldehyde, it is now termed "direct reductase reaction," and in the presence of aldehyde, the "indirect reductase reaction."

THE TEST.

In making the test a control sample should be used for comparison of colour. After the addition of the reagent to the milk, the length of time elapsing from its addition until the milk turns white should be noted. If this occurs in less than three hours the milk is already "old." Here, however, "age" does not mean the length of time elapsing since the milk was drawn from the udder, but that the milk has "aged." Thus, milk produced under dirty conditions, imperfectly cooled, and transported in badly cleansed cans, "ages" more rapidly than that produced under hygienic conditions.

It is advocated by some that in making the test it is necessary to cover the sample in the reagent glass with boiled oil or kerosene, but there is no advantage in doing so.

A satisfactory method of determining the reduction property of milk is that recommended by Ernst. For each sample of milk ten small tubes are used, containing one, two, three, four, up to ten drops of M.B. solution respectively. Into each tube 5 c.c. of milk is added. After one-quarter, one-half, one, and two hours, &c., observations are made as to what extent the milk has been reduced. This method is quite simple, and eliminates the constant watching of the samples in order to detect the time when the reduction is complete, and by this method both time and degree are determined. If, for instance, a milk is reduced in three hours to tube 8, then the formula will be: R3 = 8. Good milk reduces the first two tubes only after two to three hours; fresh milk only after ten to eighteen hours.

OBSERVATIONS.

The reducing qualities of different organisms towards methylene blue undoubtedly vary. Jensen has carried out considerable researches in this connection, and has shown the reduction qualities of a series of organisms found in milk. He further proved that varieties of the colom group, staphlycocci mould fungi, and sarcina reduce rapidly, whilst *acid streptococci* do not decolourise the solution.

Arranged in order of the length of time, reduction takes place as follows:—

B. fluorescens non-liquefaciens..	8 minutes
B. acidi lactici (Hueppe)	12 "
B. prodigiosus	10-15 "
B. fluorescens liquefaciens	13 "
B. coli communis	17 "
B. subtilis	30 "
B. mesentericus vulgatus	60 "
Streptococcus acidi lactici Oidium lactis	not in 80 minutes.

From the above table it is obvious that milk contaminated with the excreta of cows or dirty straw, which contain *B. coli communis* and *B. subtilis,* respectively, will take a much longer time to react to the reductase test than milk containing numbers of *B. acidi lactici.*

Milk with a high bacterial content reduces methylene blue solution in a period of time directly in proportion to the numbers and kind present. Milk drawn from the udder in a sterile condition fails to reduce the M.B. even after a few days. According to Müller, freshly drawn and cleanly handled market milk requires ten, twelve, or more hours for reduction (mixing 10 parts to 1 part M.B.), whereas fresh market milk in cold weather requires six to nine hours, and in warm weather one to two hours.

At the end of the incubation period, when the bacteria commence to multiply, the time required for reduction amounts to from one to two hours. The addition to fresh milk of manure or sour milk hastens the time for reduction. Thus factors favouring bacterial growth hasten the reduction.

From the writer's own observations, he found that 10 c.c. of milk containing about 50,000 bacteria per c.c. failed to reduce 1 c.c. of M.B. solution in six hours.

With approximately—

250,000	bacteria,	reduction took	place in	5½	hours
500,000	”	”	”	3½	”
1,700,000	”	”	”	2½	”
10,000,000	”	”	”	70	min.
400,000,000	”	”	”	30	”
700,000,000	”	”	”	15	”

EFFECT OF ACIDITY.

There exists a direct relationship between the growth of bacteria and the production of lactic acid, the organisms converting lactose into lactic acid; hence there exists a certain connection between the degree of aidity of milk and the rapidity of reduction. Further, since the degree of acidity increases rapidly after the completion of the incubation period, a rapid reduction would be expected to follow the increase in the degree of acidity.

That such is the case has been proved by the experiments of Jensen, who observed that milk which reduced in one minute after twelve hours at 25 degrees C. had a degree of acidity of 36.

Milk reduced in—

5	minutes	after 12 hours	at 25 degrees	had a	degree of	acidity of ..	19
8	”	”	”	”	”	” ..	20
6	”	”	”	”	”	” ..	35
10	”	”	”	”	”	” ..	22
1	hour	”	”	”	”	” ..	15
½	”	”	”	”	”	” ..	25.5
1¾	”	”	”	”	”	” ..	11.5
2¼	”	”	”	”	”	” ..	15
3¾	”	”	”	”	”	” ..	9
6½	”	”	”	”	”	” ..	8
12¼	”	”	”	”	”	” ..	7

The writer made observations of the effect of acidity on the length of time required for reduction of the methylene blue, and his results are similar to those of Jensen.

The following table compiled by Ernst shows the results of the technique employed in testing milk, where the reduction number is understood to mean the number of drops of methylene blue solution which in a given time were completely reduced by 5 c.c. of milk:—

Degree of Acidity.	After Twenty-four Hours at 20 Degrees.	Time Required for Reduction.	Reduction Number.
7.0	7.4	20 hours	0
6.2	8.6	20 „	0
6.0	10	20 „	0
6.0	9	20 „	4
7	10	20 „	0
6	24	4 „	2
6.4	26.5	8 „	10
6.5	26	8 „	6
6.2	24	8 „	8
6.2	27	8 „	6
6.8	23	8 „	4
6	14	8 „	4
7.8	30	6 „	4
6.5	28	2 „	2
7.2	32	1 „	2
6	34	1 „	2
6.2	38	1 „	10
8	40	5 „	10
10.5	26.4	0.5 „	10
6	30	6 „	2

The above numbers are the results obtained by him from a large number of samples of milk indiscriminately selected from a milk control station, and they go to show that milk which sours rapidly also reduces rapidly. It is to be noted, however, that there is no constant relationship between the values of acidity of milk after twelve and after twenty-four hours, nor with the values of fresh milk.

After milk becomes thoroughly sour, reduction practically ceases, and this in all probability is due to the fact that the acid formed inhibits the reduction power.

The addition of an alkali such as sodium carbonate restores the reduction properties. It may, on the other hand, be due to the "normal" milk organisms forming such a quantity of lactic acid that their growth is inhibited, thus allowing the *acid streptococci* or mould fungi to outgrow them.

EFFECT OF ANTISEPTICS AND HEAT.

The reduction power of bacteria may be inhibited or destroyed by such antiseptics as boric acid, salicylic, and formaldehyde. This effect can also be obtained by heating the milk for ten to thirty minutes at 80 to 100 degrees C., destroying, as it does, the bacterial cells.

TAINTED MILK.

It should be borne in mind that milk which would normally be condemned on account of its bad taints, such as "soapy milk," might possess quite a slow reducing power, provided that such a condition was not associated with extensive bacterial contamination from other sources. Although the bacillus causing "soapy milk" (*B. lactis Saponacei*, Weigmann) reduces rapidly, a comparatively small number of such organisms will produce the "soapy taint." Milk condemned on account of a taint does not then necessarily contain many of the taint-producing organisms; hence it does not follow that tainted milk will reduce rapidly.

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Plate 1a.—Picking Citrus Fruit to avoid Bruising.

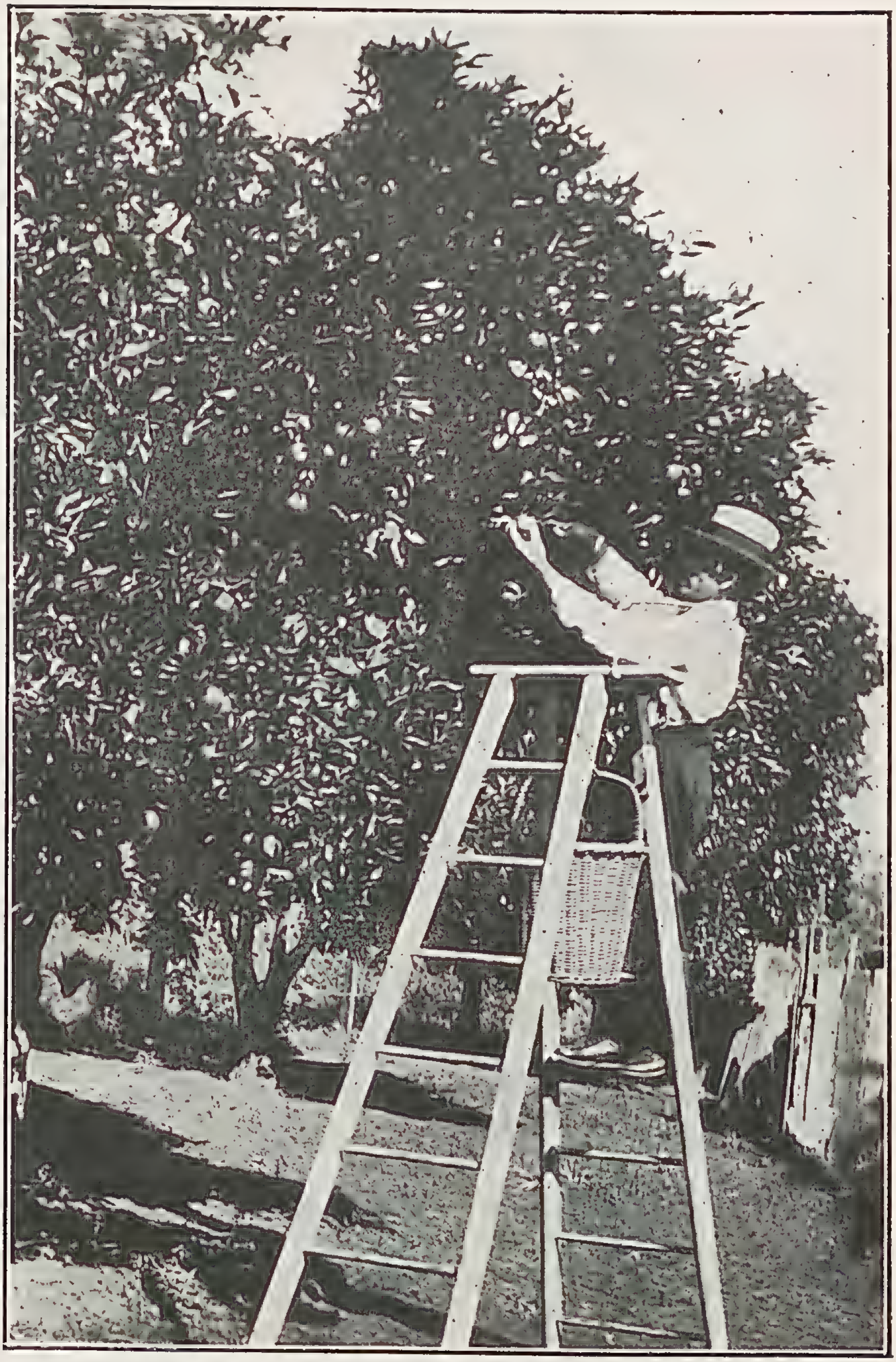


PLATE 2A.—PICKING CITRUS FRUIT TO AVOID BRUISING.

The Orchard.

NOTES ON CITRUS CULTURE.

By SALVATORE SCERRI, Assistant Instructor in Fruit Culture.

In my visits to citrus orchards in the North Coast district, I have had to point out the great want of knowledge shown by many citrus-growers with respect to the management and working of their orchards. In very many cases the land has not been well prepared, the trees badly planted, the pruning has not been correctly done, and the cultivation of the land bad. In the various demonstrations I have given I have pointed these faults out, and have shown how they can be overcome.

In the first place, where the land has been badly prepared, it was not thoroughly and deeply worked before the trees were planted; therefore, the bottom soil was so hard that the roots of the young trees could not penetrate it. This is wrong treatment, as the bottom soil should be well worked, so that the roots can go well down into it.

In the second place, the trees have been badly planted. [*Note* 1.—A great mistake in the past has been the planting of citrus trees too shallow. The young trees should be planted in a basin, so that when the soil was eventually levelled it would be 6 in. above the point where the tree was bedded.] Not only have the roots been badly pruned and surface roots allowed to remain, but the main roots have not been set so as to encourage their going down into the soil, but have been allowed to grow along the surface where they are not wanted. [*Note* 2.—As regards the cutting away of surface roots, much care is required, because the root system is very hard to treat, and only one or two of them should be cut away every winter.]

In the third place, many of the young trees have been badly pruned at the start, as, instead of allowing only three main branches to remain to form the head, and these three branches having an upward and outward trend, a number of useless limbs have been left which are of no good to the tree, as they crowd the head and prevent the proper growth of these main limbs, which are needed to form the future tree.

This improper pruning at the start has given me a lot of trouble when pruning older trees, as I am frequently obliged to cut away a large number of useless branches that should never have been allowed to grow from the start.

If the young tree is given its correct shape in the beginning, and all crossing, useless, or superfluous branches—such as branches on or near the ground or growing towards the ground—are cut away as soon as they make their appearance, the tree will not require the heavy pruning now so often necessary when it gets older. The pruning out of the small wood at the right time can be done quickly and easily with a good sharp pair of pruning shears; but, if this is neglected, then those same branches will grow to a large size and need a strong chisel and a mallet to remove them.

In the fourth place, the cultivation is bad, the land between the trees being badly worked. If the land has not been well worked before the trees were planted, the roots come to the surface; and orchardists are afraid to cultivate the land deeply for fear of injuring the roots. This is all wrong, as surface roots are not good in every climate. The surface soil must be kept well and deeply worked, so as to have a good soil mulch to keep in the moisture and keep the trees growing during dry weather. The land must be well ploughed between the trees with a disc plough and dug underneath them, which will cut and not tear any roots it touches, and the ground so ploughed and dug must be kept well and deeply stirred to retain the moisture.

Neglected orchards require severe treatment to get them into proper shape. [*See Note* 2.] Surface roots must be cut away, the soil well worked up, and the top of the tree reduced so as to correspond with the smaller root system. There must be a proper balance between roots and top. Once the trees are in proper shape, they must be kept so. A well-kept orchard will pay, but a neglected one won't.

Many trees are worked on wrong stocks. The common lemon should not be worked as a stock, as the trees worked on it won't last. The Seville and sweet orange stocks are much better, as trees worked on these will last for many years. Grow healthy trees on well-prepared and well-cultivated land, and prune them properly; and you won't want to do so much spraying. I do not consider too much spraying good for trees.

Where trees have been treated by me in the manner I have described, they are now bearing much heavier crops than those that have not been treated, proving the value of proper pruning and the proper working of the land. Not only do many growers neglect their trees and orchards, but they handle the crop very badly. It is often carelessly picked and badly handled; and, in order to show the methods in use in Malta, I have had a picking ladder fitted with Stemp's patent and picking baskets specially made for demonstration purposes. The illustration herewith shows how the ladder is made, and how the picking basket is fixed, either on the top of the ladder or hung under it in a convenient position to be filled by the picker. The baskets are padded so as to prevent the fruit from being bruised, and the fruit is all cut from the tree, a small portion of the twig to which the fruit is attached, and which is of no further use, being removed, and this bit of twig is cut off before packing the fruit; so that the gathering of the fruit and the pruning of the outside of the tree are done at the same time, thus saving time and labour.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1919.	Dec., 1918.
North Coast.	In.		In.	In.
Atherton	7·68	18	1·13	4·12
Cairns	9·43	37	1·01	4·94
Cardwell	8·59	47	0·73	3·90
Cooktown	7·20	43	1·43	4·71
Herberton	5·66	32	0·77	3·81
Ingham	7·37	27	1·26	5·21
Innisfail	12·56	38	1·34	4·73
Mossman	13·48	11	2·59	10 97
Townsville	5·72	48	0·68	0·80
Central Coast.				
Ayr	3·82	32	0·93	2·31
Bowen	4·45	48	0·09	0·85
Charters Towers ...	3·60	37	0·22	0·35
Mackay	6·99	48	0·14	0·25
Proserpine	9·17	16	0·27	1·57
St. Lawrence ...	4·38	48	0·03	0·43
South Coast.				
Biggenden	4·32	20	0·45	0·74
Bundaberg	4·38	36	0·05	1·38
Brisbane	4·91	68	1·58	0·88
Childers	4·98	24	0·22	0·70
Crohamhurst ...	6·69	26	0·45	3·02
Esk	4·27	32	2·01	1·54
Gayndah	3·78	48	0·53	1·25
Gympie	5·79	49	0·06	0·69
Glasshouse M'tains	7·13	11	1·26	1·92
Kilkivan	4·20	40	0·03	1·38
Maryborough ...	4·48	48	0·10	2·24
South Coast—continued:	In.		In.	In.
Nambour	6·32	23	1·13	3·14
Nanango	3·61	37	0·43	1·83
Rockhampton ...	4·41	32	0·39	2·91
Woodford	5·34	32	2·40	1·86
Darling Downs.				
Dalby	3·14	49	2·40	3·84
Emu Vale	3·52	23	2·47	3·52
Jimbour	3·13	31	1·86	2·32
Miles	2·47	34	0·84	0·56
Stanthorpe ...	3·48	46	0·93	3·27
Toowoomba ...	4·17	47	1·27	2·33
Warwick	3·44	32	1·62	2·57
Maranoa.				
Roma	2·29	45	1·73	0·27
State Farms, &c.				
Bungeworgorai ...	2·58	5	1·29	0·43
Gatton College ...	3·39	20	1·82	1·57
Gindie	...	...	0·52	Nil
Hermitage ...	2·84	13	1.73	3·31
Kairi	9·35	5	0·79	5·61
Sugar Experiment Station, Mackay	8·62	22	4·04	0·33
Warren	3·76	5	Nil	2·10

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Tropical Industries.

THE CULTIVATION OF SUGAR-CANE IN QUEENSLAND.

BY HARRY T. EASTERBY, General Superintendent, Bureau of Sugar Experiment Stations.

PART VI.

CANE CULTIVATION ON OLD LANDS—*continued.*

IRRIGATION AND APPLICATION OF MANURES.

IRRIGATION.

The climatic variations in Queensland from year to year are often so great that canegrowing is only certain in those districts possessing a high average rainfall. Districts with an average rainfall of 50 inches and under suffer exceedingly during dry spells, and irrigation would prove highly payable in such localities.

At the present time the only canegrowing district that uses irrigation water to any extent is the Lower Burdekin, situated some 40 to 50 miles south of Townsville. On the north side of the Burdekin River irrigation has been practised for a number of years, the plants used being the property of the farmers. Water is found at shallow depths, and is easily obtainable by sinking spearheads. On the south side of the river the Government are installing a complete system, which will be available to growers of cane. Wells are being sunk and the pumps will be electrically driven from a central power-house.

The cost of applying irrigation water on the Lower Burdekin is comparatively high, even though the most economical method is used. Consequently, there is a tendency to do as little of it as possible, and, in many instances, to postpone the application if rain appears probable. This frequently leads to the suffering of the crop should rain fail to fall, and the irrigation has not been carried out.

Water is not applied scientifically to cane crops on the Lower Burdekin, so that the greatest efficiency is not secured. This, however, is largely due to the high cost of application. The method of irrigating is to run the water in shallow furrows between the cane drills, usually made with the disc harrow known as the Cotton King Cultivator. The water is generally conveyed by fluming to the main ditch running on the headland at right angles to the cane rows. The water is then admitted to the channels between the cane, but as no attempt has been made to grade the land a great deal of water is often wasted.

In Hawaii the water is usually applied directly in the furrow or drill in which the cane plants are growing. The preparation of the land is more expensive, as it is laid out for irrigation according to the land contour, and the drills are cut into short sections so as to secure an even distribution. This method secures the largest economy of water. In the Queensland system, as practised at Ayr, it is not generally possible to evenly distribute the water over all the land, consequently some of the area goes short while other parts obtain too much. This system, therefore, involves the greatest waste of water, but is the cheaper as far as actual application is concerned. This is, of course, a vital point in the cultivation of cane in Queensland, where the costs of labour are so high. It is usual to only make one or two, or at most three, applications of water on the Lower Burdekin, but these are large in volume, running up to six inches.

In Hawaii, on the contrary, the applications are smaller, but far more frequent, ranging from the equivalent of half-an-inch of rainfall per week, to three inches or more, as the crop makes greater demands upon the soil. These irrigations are carried on until the crop nearly reaches maturity; they are then stopped, so that the absence of water may have the effect of ripening the cane crop. With such a system the application of manures can be carried out in the most satisfactory manner, and the combined use of water and fertilisers renders the cane crops of Hawaii the heaviest in the world, while the production of sugar per acre is also higher than elsewhere.

As irrigation for cane must eventually play a large part in sugar production in the drier cane areas of the State, the matter will ultimately have to be taken in hand, so that the water may be applied in the most economical way, and no doubt the Hawaiian system, which has proved so successful, will be tried. It is a noteworthy fact that much larger crops can be grown with irrigation properly applied in dry areas than on lands where the rainfall is plentiful.

THE APPLICATION OF MANURES.

The manurial elements needed in the growing of successful cane crops are nitrogen, potash, and phosphoric acid. These are usually supplied in the following fertilisers:—

Nitrogen in—

Nitrate of soda	contains about	15	per cent. nitrogen.
Sulphate of ammonia	,,	20	,,
Nitrate of lime	,,	12½	,,
Nitrolim	,,	18	,,
Dried blood	,,	11	,,
Meatworks manure	,,	3 to 7	,,

Potash in—

Sulphate of potash contains about 52 per cent. potash.

Phosphoric acid in—

Superphosphate	contains about	16	per cent. phosphoric acid.
Rock phosphate	„	18	„
Guano	„	15	„
Thomas phosphate	„	17	„
Meatworks manure	„	17	„
Bonedust	„	20	„
Basic superphosphate	„	19	„

Phosphoric acid is found in a readily soluble form in superphosphate, it being practically all water-soluble in that material. In the other forms shown above, the phosphoric acid may be partly citrate soluble, and partly citrate insoluble. The following explanation of these terms is taken from a pamphlet by the Agricultural Chemist (Mr. J. C. Brünnich) :—

"In bones, and in most of the mineral phosphates, phosphoric acid exists in combination with lime, in the form of a calcium phosphate: tricalcic phosphate, which is insoluble in water and in citric acid solutions, but soluble in mineral acids. On account of this insolubilty the action of bone manure and mineral phosphates is exceedingly slow, and may extend over many years. The finer the bones or the phosphates are crushed or powdered the quicker will be the action, and for this reason the fineness of the bone meal is of importance, and should be stated.

"When strong sulphuric acid is allowed to act on this insoluble tricalcic phosphate, part of the lime combined with the phosphoric acid is withdrawn, lime sulphate or gypsum being formed, and the phosphoric acid is left in the form of monocalcium phosphate.

Bone phosphate or tricalcic phosphate. + Sulphuric acid. = Gypsum. + Monocalcium phosphate or superphosphate.

"This new compound is soluble in water, and therefore readily available to the plants, but on account of the special process of manufacture it is the most expensive form of phosphoric acid in our fertilisers. The superphosphate is generally manufactured from steamed bones, bone ash, and mineral phosphates. Mineral phosphates containing a high amount of iron or alumina are not suitable for the manufacture of superphosphates, because these bases readily recombine with this acid phosphate, to form again insoluble phosphates, called reduced or reverted phosphates. A similar change would take place if lime were added to superphosphate, and also in soils containing a large amount of lime, a dicalcium phosphate may be formed, which is insoluble in water, but soluble in citric acid solutions. Another form of a lime phosphate is found in basic slag or Thomas phosphate—namely, tetracalcium phosphate, which also is insoluble in water, but soluble in saline solutions, particularly such which contain salts of citric acid. These last two compounds are, therefore, classed as citrate soluble phosphoric acid, which is fairly readily absorbed by the plant roots, and, therefore, comes close in its value to the water-soluble phosphoric acid. Basic slag is an artificial product, and should be ground as fine as possible, and a good sample of this fertiliser should nearly all pass through a sieve having 100 meshes to the linear inch. Thomas phosphate is one of the cheapest and best sources to supply phosphoric acid; it is of particular value to sour lands, deficient in lime but rich in humus.''

HINTS ON PURCHASING AND USING MANURES.

1. Do not take delivery of manures unless they are accompanied by an invoice certificate, containing the guaranteed percentage of the article purchased, or, in the case of a mixture, the guaranteed percentages of the different ingredients.

2. Do not accept delivery of bags of fertiliser that are not labelled or branded.

3. It is much wiser not to buy fertiliser of low grade, as you may have to pay freight on a lot of useless material.

4. Always see you obtain the manure you order.

5. Do not give a higher price per ton than the registered price under the Fertilisers Act. This may be seen periodically in the ``Agricultural Journal.''

6. Do not buy more manure than you intend using, as fertilisers do not improve with keeping. If possible, mix your own fertilisers, as you can vary the proportions to suit your own requirements.

8. Always remember you want to manure the crop—not the land.

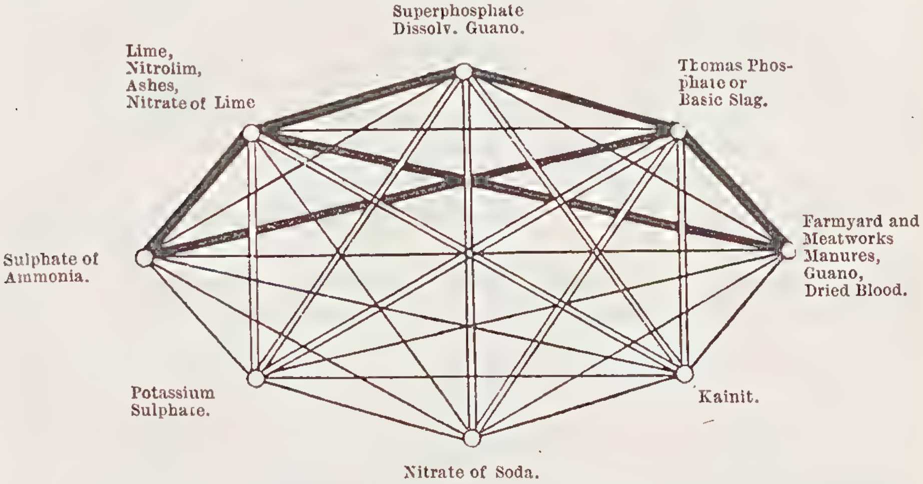
9. Prevent bags of fertiliser from getting wet. This always leads to loss, and frequently sets the manure in hard lumps difficult to break up.

10. Finally, always bear in mind that fertilisers give the best results on well-tilled soils, and that they also need moisture in the soil. Applying fertilisers in time of drought is waste of manure.

Under the Fertilisers Act it is required that the dealer shall at the time of sale, or before delivery, give to the buyer an invoice certificate signed by the seller or his agent, stating the full name and place of business of the dealer; the name, trade mark, brand, or sign used to mark packages containing such fertiliser, and used to identify such fertiliser; the quantity or net weight of fertiliser comprised in the sale; the composition of the fertiliser, setting forth the proportion per centum in which such fertiliser contains the following ingredients:—Nitrogen, phosphoric acid, potash, and lime, and the respective forms in which they respectively occur; and, in the case of bonedust, basic slag, agricultural lime, &c., the percentage of coarse and fine material.

Furthermore, every dealer who sells fertiliser, which term includes offering or exposing for sale and having in possession for sale, shall securely affix to each package a printed label, clearly and truly certifying:—The number of net pounds of fertiliser in the package; the figure, trade mark, or sign under which the fertiliser is sold; the chemical composition of the fertiliser, in the same manner as stated on invoice certificate; and the state of fineness for certain fertilisers.

In mixing fertilisers, care must be taken not to bring ingredients together which would lead to decomposition or loss of some part of the manure. Thus, should lime be mixed with sulphate of ammonia, a loss of nitrogen would take place. A simple guide for the mixing of manures is given in the accompanying diagram:—



Manures joined by a *heavy black line* should *never be mixed* together ; those connected by a *double line* must only be *mixed immediately before use* ; and those joined by a *thin single line* may be safely *mixed* together *at any time*.

Before applying fertilisers, it would be wise to send samples of the soil of the farm (not less than 5 lb. in weight) to the General Superintendent, Bureau of Sugar Experiment Stations, Brisbane, for free analysis and advice, accompanied by a form giving full particulars. These forms may be obtained from the office of the Bureau in Brisbane, but many secretaries of the different Farmers' Associations have supplies.

In the absence of an analysis of the soil, the following mixtures have generally been found of great benefit to cane crops:—

No. 1.

200 lb. nitrate of soda per acre.
100 lb. sulphate of potash per acre.
300 lb. superphosphate per acre.

No. 2.

250 lb. sulphate of ammonia per acre.
100 lb. sulphate of potash per acre.
300 lb. superphosphate per acre.

On a percentage composition this mixture would approximately contain—

Nitrogen	7·7	per cent.
Potash	7·7	,,
Water-soluble phosphoric acid	7·0	,,

No. 3.

Nitrate of soda	200 lb.	per acre.
Sulphate of potash ..	150 lb.	,,
Meatworks fertiliser ..	300 lb.	,,

No. 4.

Nitrate of soda	200 lb. per acre.
Sulphate of ammonia ..	200 lb. ,,
Sulphate of potash ..	150 lb. ,,
Superphosphate	300 lb. ,,

It may be asked which of these mixtures is the best to use. No. 1 is a fairly cheap mixture. No. 2 contains somewhat more nitrogen and is a well-known formula sometimes sold as "Three Sevens" or "Cane Mixture." No. 3 would be suitable for Northern lands, while No. 4 is a more expensive fertiliser, but it would yield correspondingly higher crops on lands with a good rainfall.

In all these fertilisers, one-half of the nitrogen should be applied with the remainder of the manure as a first dressing, in drills on each side of the cane, and then covered; and the balance of the nitrogen should be applied as a top dressing at an interval of about two months.

Nitrate of soda is easily leached from the soil; hence it should not be applied during a heavy wet season. It is a great plant stimulant, and has frequently been found to add such strength and vigour to cane plants, that it strongly aids in obtaining other mineral food, such as potash and phosphoric acid from the natural reserves in the soil. Nitrate of soda will often show its effects in a week or two, producing a rich, dark-green colour in the foliage, and cause a marked improvement in the growth of the cane.

Nitrogen, in the form of sulphate of ammonia, is not so quick in action as in nitrate of soda, while nitrogen in dried blood, bonedust, and meatworks manure is still slower in action, as they require chemical changes to convert them into nitrate, so as to become available to the plant.

Meatworks, in the wetter cane areas of North Queensland, is often preferred to superphosphate as being less soluble. It can be substituted for superphosphate in any of the above mixtures where desired.

As a rule, considerably more benefit is got from the manuring of ratoons than from the manuring of plant cane, and this experience is common. This is strikingly shown in the following summary of experiments carried out at Mackay:—

PLANT CROP.			FIRST RATOON CROP.		
Manures.	No Manures.	Difference.	Manures.	No Manures.	Difference.
50·7	47·4	3·3	42·4	31·7	10·7

SECOND RATOON CROP.			THIRD RATOON CROP.		
Manures.	No Manures.	Difference.	Manures.	No Manures.	Difference.
38·8	24·1	14·7	35·9	19·8	16·1

The above are in terms of tons of cane per acre.

The manures applied in the above cases were a mixture of nitrogen, potash, and phosphoric acid.

It is not recommended that mixed fertilisers should be placed in the drill with the cane plants. As soon as the cane is about 18 inches high, drills 4 to 5 inches deep should be drawn about 10 inches from the young cane on each side of the row, and the fertiliser is put into these drills and then covered, or a manure distributor can be used. Both sides of the row, however, should be treated. If nitrogenous fertilisers alone, such as nitrate of soda and sulphate of ammonia, are being used, they can be applied on the surface of the soil near the cane. Organic forms of nitrogen, such as meatworks and blood manures, requiring the action of soil organisms to render them available, should be placed in drills and covered.

For ratoons, the manures can be applied while working the interspaces. They may be dropped in the furrow ploughed away from the cane, and then covered.

For the continued successful use of artificial fertilisers, the land should not be acid in reaction. Considerable risk is involved in the continued use of manures such as sulphate of ammonia, sulphate of potash, and acid phosphates, *unless lime dressings have been previously made.*

On given soils, particularly on some of the red volcanic type, better results from the use of organic fertilisers, such as bonemeal, blood manure, meatworks manure, &c., have been realised. Megasse ash, molasses ash, and filter press cake should all be availed of when they can be procured. The latter should be ploughed in, some three or four months before the cane is planted, and the same may be said regarding the application of molasses when used as a manure.

Sugar-cane removes varying amounts of the vital elements from the soil. It is estimated, from analyses of the total cane plant (except roots) made in the Agricultural Laboratory, that the variety known as Clark's Seedling, 16 months old, took from the soil 163 lb. of potash, 83 lb. of phosphoric acid, and 96 lb. of nitrogen, while the variety known as Badila, of the same age, took out of the land 139 lb. of potash, 44 lb. phosphoric acid, and 107 lb. of nitrogen.

(*To be Continued.*)

NOTES ON THE NORTHERN SUGAR DISTRICT.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant (Mr. J. C. Murray):—

Throughout the month the districts of Cairns, Herbert River, Ayr, and Bowen have been visited, and as many farms as possible inspected.

CAIRNS.

Crushing operations were in full swing here at the beginning of the month, with expectations of another fortnight's work. The season's run has been fairly successful, the industrial questions having been well and thoughtfully handled. Good tonnages of cane have been attained with fairly high percentages of sugar. Grubs and other cane pests continue to exercise the minds of most of the growers; but, in spite of these and other drawbacks, such as very dry weather conditions, farmers should consider themselves fortunate, compared with the lot of sugar-producers south of the tropics this year.

As usual in the Cairns area, cane-growers are devoting much time and labour to intensive cultivation and the reviving of exhausted lands. This example could be well followed by a great many other districts where cane lands are rapidly becoming exhausted through lack of green manuring and liming. Naturally, this latter work is difficult to properly carry out, but even a little done annually would have an excellent effect.

With regard to varieties growing in the Cairns district, the only ones not noted in previous reports, and which are doing fairly well, are two canes imported from Fiji by the Colonial Sugar Refinery Company—viz., ''Pompey'' and ''Remus.'' They appear, as far as can be judged at present, to be vigorous growers. With regard to others growing, Badila is still the principal cane. Both this and Clark's Seedling have been giving very satisfactory results and will be difficult to replace. Q. 813 and Q. 855 are canes that will probably give satisfaction in these areas if they are tried in the field.

Taking the district right through, the prospects for next year are good, especially if reasonable rainfalls occur to give the early plant crop a chance.

HERBERT RIVER.

The keynote of complaint here is lack of rain. There is no doubt, for a place with an average rainfall like the Herbert River, that the weather conditions have been extraordinary. Yet, in spite of this, the prospects for next year are good, especially with regard to the early plant crops of Clark's Seedling and Badila. The ratoons as yet in most canes are fairly green and strong; and, although the soil is very dry and baked on the surface, there is yet a fair quantity of moisture in the intermediate strata and the subsoil.

Crushing and cutting operations have been proceeding smoothly, with the exception of a machinery mishap at Macknade Mill.

Many of the growers at present are paying more attention to the question of liming than hitherto; and there are prospects that, in the near future, this will be carried on vigorously.

With regard to varieties growing, the principal ones are Badila and Clark's Seedling. Small quantities of 24 B and 1,900 Seedling are being grown; also D 1135. Another cane (H.Q. 409) is a variety that will probably justify planting; it ratoons well, has a high sugar content, and, generally speaking, displays characteristics that should make it of value to the farmer.

Considerable quantities of meatworks manure are being used for fertilising purposes with a fair amount of success. While this manure may benefit the growing cane in some instances, it by no means follows that meatworks manures are ideal for all the Herbert River soils. Farmers would be well advised before using artificial manures to get an analysis made of the soil, or, if they have already done this, to carefully study the report.

AYR.

Irrigation was in full swing at Ayr during November, and some very fine crops of cane were being cut.

The percentage of sugar also compares very favourably with other districts. There can be very little doubt that these results are obtained through the successful grappling with the irrigation problem. There are no finer examples of growing cane to be found than some of the irrigation Badila, near Plantation Creek.

There are several growers who possess irrigation plants with about 100,000 gallons per hour capacity; and the following, with regard to the weekly cost of a 120,000-gallon per hour plant, may be of interest:—

	£ s. d.
Fuel	1 17 0
Oil	0 10 0
Wages	5 0 0
Depreciation	1 0 0
Total	£8 7 0

This is for a working week's continuous pumping.

This pump could irrigate about 8 acres per day to the equivalent of about 3 in. of rain. Of the varieties growing in the Ayr district, Badila and Clark's Seedling are finding the most favour. The Goru canes are still grown fairly extensively.

Of the N.G. cane distributed by Mr. McKenzie this year, the following are out on the farms growing:—N.G. 89, 165, 164, 141, 103; also, Q. 903, 855, and 813.

It is probable that, out of all these, the last-mentioned is the most suitable for the Ayr district.

Good strikes of cane have been obtained by some farmers this year, after using second ratoon standover cane for plants.

This is risky, and would result more often, probably, in failure than success.

Some of the cane is still suffering from a very severe frost last July. A lot of the frosted cane died, but some has recovered and is doing fairly well.

Farmers in the Ayr district are keen on agriculture and experiment work, and eagerly look for any information on their subjects that will benefit them. Numbers of growers are devoting much time to the question of reviving old lands and liming. Advice on the matter was frequently given and is being acted upon.

Cane pests are giving the farmers in the Ayr district very little trouble this year. Coots are causing a little worry in some places near the water, but other pests at present are a negligible quantity.

BOWEN.

Only mixed farming is going on around Bowen at present. Tobacco, citrus fruits, legumes, and cotton are all absorbing the growers' interests. Some farmers have small areas of Badila and Clark's Seedling, but the consensus of opinion is that, unless they can get a small mill there is nothing in sugar-growing. This is true as matters stand at present, and it also is very unfortunate because the Bowen soil will produce very good crops of sugar-cane. The farmers say that rail facilities are unsatisfactory, and sometimes a promise of trucks for cane freights is forgotten altogether.

REPORT ON CANE PLANTS DISTRIBUTED BY THE BUREAU OF SUGAR EXPERIMENT STATIONS, 1919.

The Field Assistant to the Bureau of Sugar Experiment Stations (Mr. J. C. Murray), reporting to the General Superintendent upon the recent free distribution of cane varieties from the Variety Plot established by the Sugar Bureau upon the farm of Messrs. H. Ruge and Sons, at Proserpine, states:—

Forty farmers obtained plants, about 3 tons being distributed.

The varieties given out, together with their percentage of commercial cane sugar, were as under:—

Per Cent. of C.C.S.	Per Cent. of C.C.S.
Q. 813 test 14.2	N.G. 94 test 10.9
N.G. 123 test 12.2	N.G. 87 test 15.0
N.G. 103 test 12.9	N.G. 102 test 13.0
N.G. 161 test 15.7	N.G. 141 test 15.0
N.G. 88 test 8.2	N.G. 164 test 11.8
N.G. 130 test 11.9	N.G. 81 test 10.3
N.G. 147 test 14.5	N.G. 83 test 15.7
N.G. 89 test 17.0	N.G. 165 test 14.8

Of these varieties, from observations made and opinions obtained from growers, it is probable that Q. 813 is the best variety right through, although for early planting purposes N.G. 161 appears to be very satisfactory. N.G. 89 is also a good cane, striking and stooling well with a high percentage of sugar.

BREEDERS OF PUREBRED STOCK.

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
	DAIRY BREEDS—AYRSHIRES.			
W. C. Smith	"The Haven," *viâ* Goomeri	1	5	Ayrshire Society of Queensland, No. 456.

Botany.

BOTANICAL NOTES.

BY C. T. WHITE, F.L.S., Government Botanist.

(A)—DESCRIPTION OF A NEW VARIETY OF THE RED CEDAR.

Order MELIACEÆ.

Cedrela Toona, Roxb., var. **vestita,** n. var.*

Differs from the type and other Australian forms in the leaves being densely velvety pubescent on the under surface with rather long hairs.

Habitat: Parishes of Dundas and Byron (Warwick District). Assistant Forester *W. E. Moore.*

C. De Candolle, in his "Revision of the Indo-Malayan Species of Cedrela" (Records of the Botanical Survey of India, vol. III., No. 4), describes the Common Australian Red Cedar as *C. Toona,* Roxb., var. *australis* (F.v.M.), C. DC. In the same publication he describes several extra-Australian varieties of *C. Toona* as possessing pubescent or puberulous leaflets, but none seem to quite agree with the present plant. Mr. Moore's specimens are in fruit only, and it is quite possible that the flowers, when available, may show some further differences from the two previously described Australian varieties, viz., vars. *australis* and *parviflora.*

(B)—ON A HALORAGIS NOT PREVIOUSLY RECORDED FROM QUEENSLAND.

Order HALORAGEÆ.

Haloragis odontocarpa, F. v. M. Toothed Raspwort. (Plate 1.)

A tall herb with hairy stems and leaves. Leaves alternate, narrow lanceolate, tapering at the base to a slender petiole, 1-2½ inches long, edges coarsely toothed. Flowers in clusters along a slender raceme lengthening in fruit to nearly 1 foot; calyx lobes short, broadly ovate, acute, edges long-ciliate; petals, 4, linear, scarcely 1 line long; stamens, 8; styles and ovules, 4; fruit nearly 2 lines long, muricate, prominently 4-angled or almost winged.

Habitat: Charleville, *F. W. Barlow*; Murweh (*coll.?*).

Distribution.—New South Wales and Victoria.

Local Names.—In the "List of Vernacular Names for Victorian Plants" drawn up by a Committee of the Field Naturalists' Club of Victoria the name of "Toothed Raspwort" is suggested. In Western Queensland it goes under the name of "Spinach" and "Nettle," both of which are, however, applied to a number of native plants. In America, species of *Haloragis* are generally known as "Poverty Weeds."

Uses.—In forwarding his specimens, Mr. Barlow states: "A very good and useful herbage, common in good winters in this District (Charleville) and the western part of the Maranoa district. It is known as "Spinach" about Charleville and "Nettle" in the Nebine country, but it is neither a nettle nor a spinach. It is a good cattle and horse fodder."

SOME OBSERVATIONS ON WEEDS AND SCRUB UNDERGROWTH EATEN BY STOCK.

BY W. D. FRANCIS, Assistant Botanist.

Towards the end of December, 1919, the writer visited Kin Kin, and took the opportunity to make some notes on the plants that were eaten or were avoided by stock. The subject is of especial interest on account of the dry weather which prevailed and the shortage of the usual wholesome herbage—conditions which cause stock to feed on other vegetation of whose fodder value in many instances comparatively little is known.

Kin Kin is a large dairying district of the North Coast Line situated coastwards of Cooran. During the past twelve years some thousands of acres of rich scrub land have been felled and cleared, and grassed chiefly with paspalum. As the plants referred to flourish in many other districts of the North Coast Line, while

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*Cedrela Toona, var. vestita, C. T. White; varietas nova foliolis subtus dense velutino-pubescentibus.

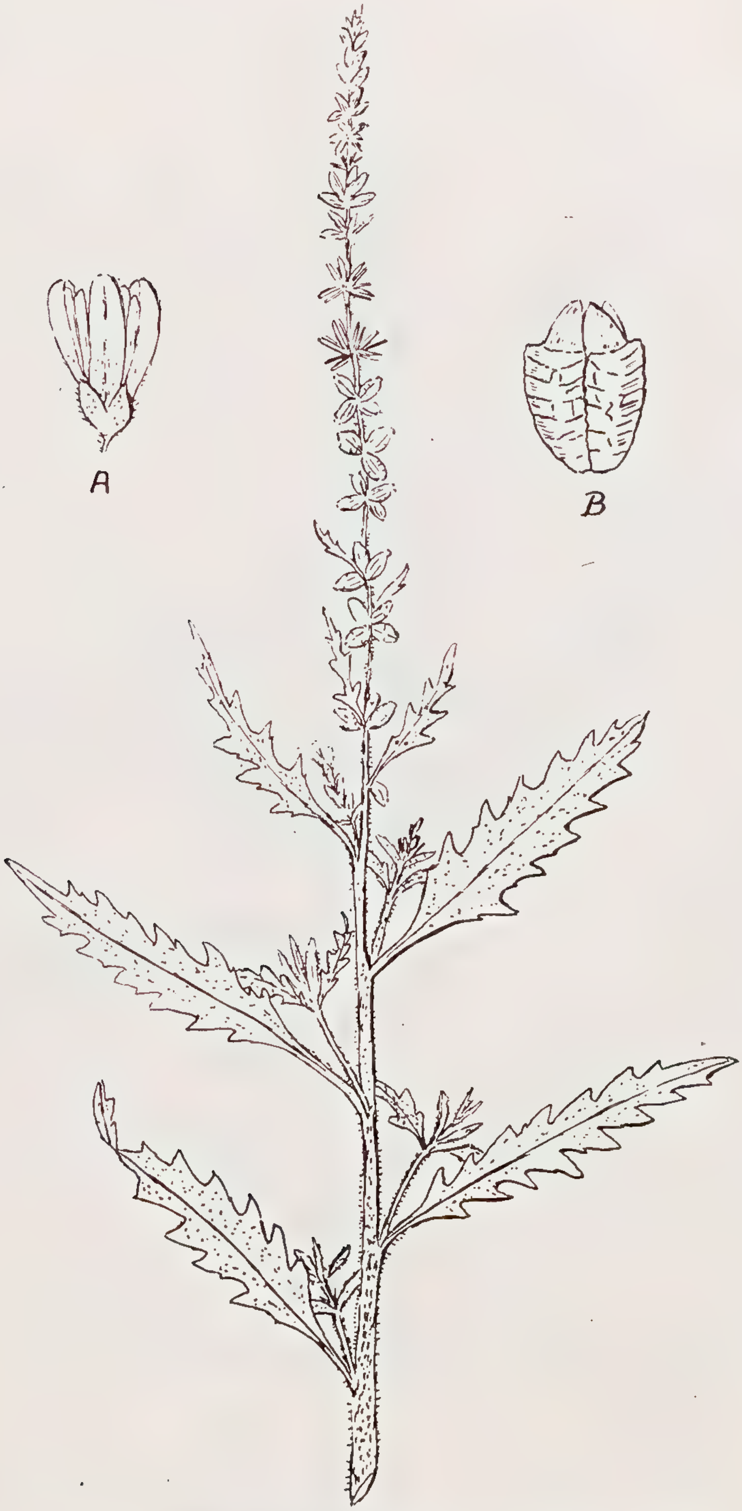

Plate 1.—Toothed Raspwort (Haloragis odontocarpa).
A useful fodder herb.
a. Male flower. b. Fruit (both enlarged).

some of them are found farther North, the following observations are applicable, to a certain extent, to a much wider area than the district in which they were made.

The undergrowth mingled with the pasture in the partly-cleared areas consists of two classes: (*a*) introduced weeds, such as Lantana; and (*b*) the native shrubs and trees, such as Brown Kurrajong.

INTRODUCED WEEDS.

THE SCOTCH THISTLE (*Cnicus lanceolatus*) is generally very abundant in partly-cleared scrub land. Its prickly flower-heads are eaten by stock, especially horses. Many large plants which had been entirely denuded of their flowering shoots by stock were frequently seen. The plant has a good reputation as a fodder, and appears to keep horses in very good condition; the glossy coats of some of the horses at Kin Kin being attributed by their owners to this plant.

THE LANTANA (*Lantana camara*).—During the dry weather stock evidently fed upon this plant to a considerable extent without any ill effects.

WHITE COTTON (*Gomphocarpus brasiliensis*) is generally avoided by stock.

RED COTTON (*Asclepias curassavica*).—A suspected poisonous plant. Generally avoided.

WILD TOBACCO (*Solanum auriculatum*).—This common pest, which is poisonous, is rarely eaten. Occasionally horses eat a few shoots of it.

INK WEED (*Phytolacca octandra*) is seldom eaten except when a very young plant of a few inches, at which stage it is often fed upon.

NATIVE PLANTS.

BROWN KURRAJONG (*Commersonia echinata*).—Often very plentiful in partly cleared areas, and is a great favourite with stock. The trees, which are often abundant on timber tracks in the unfelled scrub, are cut down for feed.

WATTLE OR SALLY (*Acacia implexa*) (Plate 2).—A common tree in cleared and partly cleared areas of scrub land, whence it spreads from the Eucalyptus forests. The trees are cut down as fodder, when the leaves are readily eaten. The species has a good reputation as a substitute for herbage. As it is abundant throughout the districts of the North Coast Line, it may be desirable for stockowners to be able to identify it, and for that purpose a figure of the leaves, flowers, and pods accompanies this article. Its bark is brown in colour and deeply wrinkled or fissured. As several species of Acacia bear pods which contain a poisonous saponin, it may not be advisable to allow stock to eat the pods of this tree. The subject of the supposed poisonous property of Acacia pods is under review.

ROUGH-LEAVED FIGTREE (*Ficus stenocarpa*).—Eaten a little. The leaves of the Moreton Bay Fig (*Ficus macrophylla*) and of a figtree resembling it in appearance, *Ficus Watkinsiana*, which is very common on the North Coast Line, are eaten by stock as they fall from the trees.

WILD PEACH (*Trema aspera*) is extensively eaten by stock. It is reputed to be harmful, but very few losses, if any, have been caused by it at Kin Kin.

NATIVE TAMARIND (*Diploglottis Cunninghamii*).—The leaves are rarely eaten, but the ripe fruits, which are very acid, are greedily eaten by pigs, who will often travel some distance in search of them, and daily revisit the trees for the fruit as they ripen and fall to the ground.

DEVIL'S FIG (*Solanum torvum*).—A large prickly shrub. Eaten slightly.

BEANTREE; BLACK BEAN (*Castanospermum australe*).—The pods are poisonous and the leaves suspected to be poisonous. Rarely eaten.

CUDGEREE (*Flindersia Schottiana*).—Rarely eaten.

CORKTREE (*Duboisia myoporoides*).—Poisonous. Rarely eaten.

TAPE VINE (*Stephania hernandiaefolia*).—Poisonous. Rarely eaten.

Panax Murrayi, sometimes called "Umbrella Tree," is a slender tree with a palm-like crown of leaves and a soft, light-coloured wood. Rarely eaten.

Mallotus ricinoides, sometimes erroneously called "Castor Oil Plant," is a common shrub with a large leaf like the Broad-leaved Nettle. Rarely eaten.

Mallotus claoxyloides.—Rarely eaten.

Mallotus philippinensis.—Rarely eaten.

Tabernaemontana orientalis.—A common shrub with forked branches and fairly large, strongly perfumed, white flowers, sometimes called "Wild Jasmine." Rarely eaten.

Cryptocarya australis.—Suspected to be poisonous. Rarely eaten.

Callicarpa pedunculata.—A common shrub with opposite leaves and dense bunches of very small purple fruit. Rarely eaten.

Legnephora Moorei; A Vine.—Poisonous. Rarely eaten.

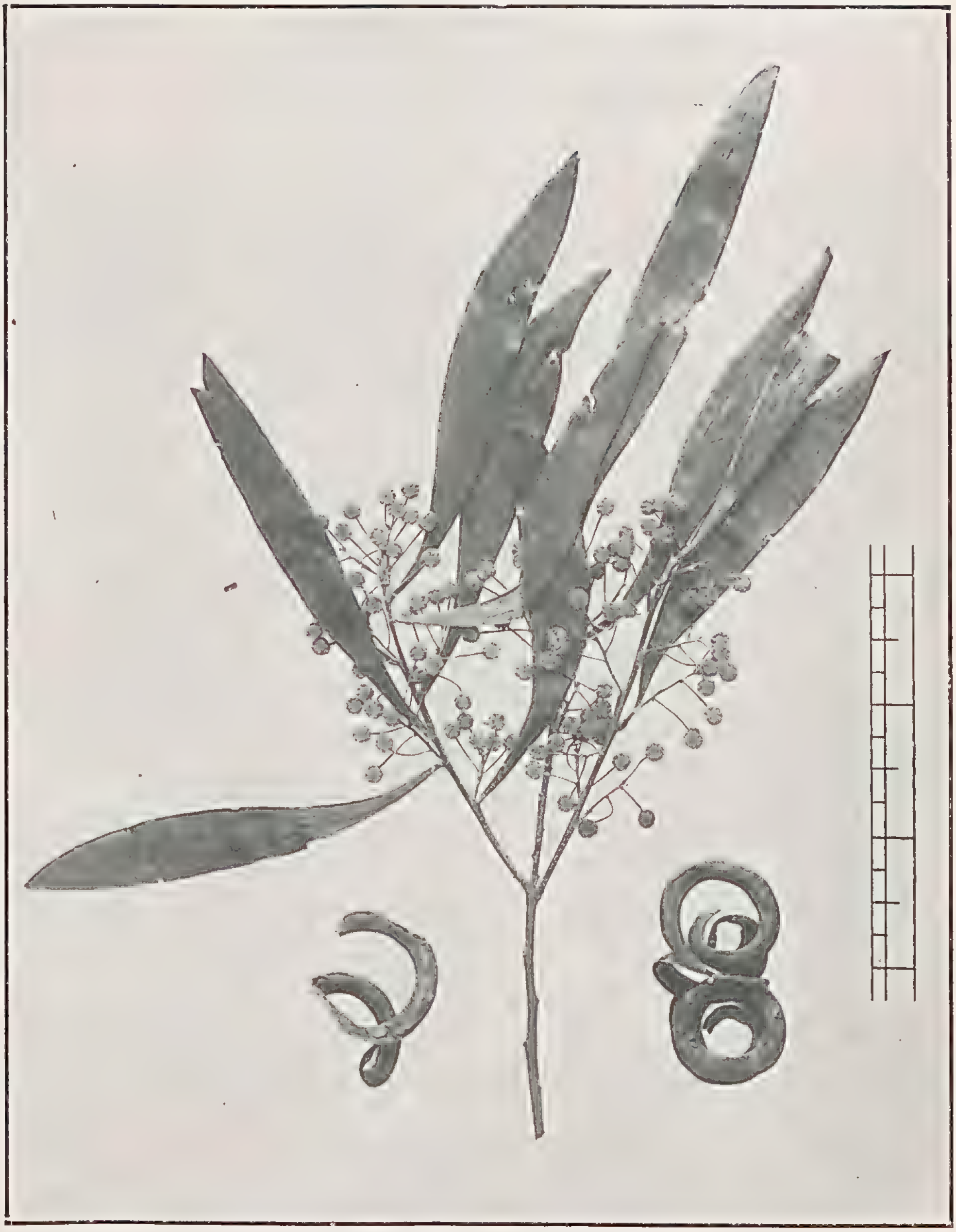

PLATE 2.—ACACIA IMPLEXA.
A useful Fodder Wattle.
(The measurement alongside represents inches and quarters of an inch).

Forestry.

CONSERVANCY OF OUR FORESTS.—NO. 3.

By THE EDITOR.

With reference to the statistics given in my last article on this subject, published in the Journal for December, 1919, I am now able, by the courtesy of the Director of Forests, to bring these up-to-date, as they appear in his Annual Report for the year 1918. The total area of Timber Reserves in the State on 31st December of that year was 2,671,139 acres, the number of Reserves being 273, including areas proclaimed during that year. There were sixty-nine State Forests, embracing an area of 1,121,900 acres, and 73,980 acres on fourteen National Parks, the revenue amounting to £71,985 1s. 8d., and the expenditure to £21,877. Receipts from forest grazing and miscellaneous receipts are not included in the revenue.

The value of the timber imported into Queensland in 1918 was £1,406,582, and of our exported timber £247,056.

The forest service timber cut in Queensland for the years 1914, 1917, and 1918 is shown as follows:—

	1914.	1917.	1918.
Sleepers and transoms (number of) ..	951,500	226,230	116,723
Piles and girders (lin. feet)	387,550	71,940	101,214
Telegraph poles and house blocks (lin. feet)	236,400	99,520	92,289
Posts, rails, and palings (number of) ..	150,900	82,530	68,267
Fuel (tons)	20,000	50,570	50,921
Sandalwood (tons)	523	454	406
Mining props (lin. feet), &c.	941,000	..	1,305,171

—the mill logs being represented by—soft woods, 38,743,067 sup. ft.; hardwoods, 7,141,934 sup. ft.; and red cedar, 172,373 sup. ft. The combined private and forest service log cut for 1918 amounted to 179,402,000 sup. ft., made up as follows:—Pine, 107,152,000; hardwoods and other timbers, 71,855,000; and cedar, 395,000—of which private temporary services supplied 74.3 per cent. of the raw material required annually for the 221 sawmills of Queensland.

Concerning the work of the Forestry Department on Fraser Island, the undertakings there were mainly along the lines of natural regeneration; and, as stated by the Director of Forests, high success was achieved with the cypress pine, despite the very arid conditions, and in the eucalyptus regeneration areas blackbutt and tallowwood gave a very heavy seed fall. In five years from sowing (26th January, 1914) a photo. of the young trees was taken (May, 1919), and they were found to be 64 ft. in height, with a girth of 21¾ in. The soil on which these trees throve so well was sandy, with some humus, the total rainfall having been 60 in.

In the experimental plantations on cleared scrub sites, seedlings set out in February did well, despite unfavourable weather. For instance:—Robinia, pseudo-acacia, at the end of the first year, was 10 ft. 6 in. in height; red cedar, 8 ft. 6 in.; kauri, 4 ft. 6 in.; hoop pine, 3 ft. 2 in. Spotted gum, an introduced eucalypt, also flourished under island conditions.

There are 273 Forest Reserves, having an area of 2,671,139 acres, and sixty-nine State Forests, and fourteen National Parks in Queensland, with an area of 73,980 acres.

For many years, forestry had very little Government recognition, and even to-day the reservations for forestry purposes only represent eighty-eight hundredths of 1 per cent. of the territorial extent. But the Forestry Department of to-day has fully grasped the position of the timber resources of the State both in the past and present, and is bringing all its energies to bear upon the most important work of conservation, regeneration, and reproduction of our most valued timbers. It recognises the critical position in which Queensland forestry stands, and points out that Mr. D. E. Hutchins, a distinguished forester, who visited Australia in 1914, set down Queensland's forest wants at a permanent reservation of 43,000,000 acres.

We would advise all our readers who are interested in the Forestry and Timber questions in this State to study the very excellent Annual Report of the Director of Forests for the year 1918.

Entomology.

ROOT-BARK CHANNELLER OF CITRUS.

DECILAUS CITRIPERDA, H.T.

COLEOPTERA, Fam. CURCULIONIDÆ, Sub-Fam. CRYPTORHYNCHIDÆ.

By HENRY TRYON, Entomologist.

(Plates I.-III.)

INTRODUCTORY.

The injurious action of this beetle on the orange first came under our notice in December, 1908. It was not, however, until nearly nine years afterwards (July, 1917) that attention to it was recalled and its noteworthy harmfulness was remarked. The late S. C. Voller, Instructor in Fruit Culture, noticed then in an orangery at Montville, Blackall Ranges, that certain trees exhibited a lack of vigour, suggestive of ''Die Back,'' but without the shedding of foliage, and on examining their root-system he found that those roots at or near the surface were apparently either dead or nearly so, and, moreover, showed evidence of having been formerly attacked by small boring-insects. In some of the smaller roots, indeed, that were still green and fresh, he found ''grubs'' or beetle-larvæ.

This discovery was in an orangery then owned by J. Snowdowne. Immediately afterwards Voller met with a second occurrence at Mapleton, and concluded that the trouble was already assuming serious proportions.

Later, in September, 1918, J. Mitchell, successor to Voller, also remarked the decadence of citrus trees at Montville; and found, too, that the roots of affected trees had failed, but—as he first considered—as the outcome of fungus-attack—?Armillaria.

In both instances illustrative specimens had been communicated by the Director of Fruit Culture, A. H. Benson, to this office, and thus had the insect origin of the trouble been confirmed. It being remarked by us, with regard to the latter, that ''The suggestion that it is a case of the action of Armillaria, or of any other fungus, finds no support in the features presented.''

The Instructor in Fruit Culture, continuing his observations, and in forwarding specimens, including examples of the beetle, reported on the condition of citrus trees that had yielded them (9th September, 1918):—''Many trees two-thirds dead; some completely gone. Root-borer and fungus very bad. Most of the main roots are dead and decaying in the soil, and there is nothing to support the tree.''

On learning these facts, the Director of Fruit Culture, A. H. Benson, devised a field experiment, aiming at the subjugation of the ''pest,'' associating with him for the purpose a Montville Fruit Growers' Experiment Plot Committee, comprising four orchardists. These investigations referred to were initiated on 2nd October, 1918, the area chosen for the work being in the orchard of Mr. G. J. Butt, a member of the committee.

This field experiment was conducted by J. Mitchell, acting under instructions of the officer in question.

On 6th September, 1919, at a conference of thirty local citrus-growers, held at Montville, it was resolved, as no practical results bearing on methods for controlling this insect had been communicated to the local association of fruitgrowers, to ask the Minister for Agriculture and Stock to send H. Tryon, Entomologist, to inquire into the trouble. The necessary local inquiry was accordingly made on 14th to 21st October, 1919.

SYMPTOMS OF THE INSECT ATTACK.

It does not appear that citrus trees with which the Root-bark Gauger is associated manifest any very characteristic features, so far as relates to their vegetative growth. They fail step by step, as do trees that are being gradually deprived of their root-system; this failure being especially emphasised by the occurrence of conditions—drying out of soil, &c.—that are generally inimical to growth. At the same time, trees may be seen in which injury to the root-system has occurred, and, further, that yield examples of the insect on inspection, and that, notwithstanding, do not manifest any indication of general ill-health whatsoever. This is, of course, a significant fact.

Of four mandarin orange trees, each of the same age (about 10 to 12 years), growing together, the only one attacked had an impoverished look, a reduced leafage, and quite a deal of die-back.

On examining the base of the stem, say, to 6 in., more or less, from the soil-surface, the earliest symptom of attack will reveal itself. Here the bark, instead of being smooth, will exhibit numerous gauged-out wounds, often partly filled with earth particles, and with roughened, raised margins. These take the form of channels, of a short irregularly serpentine course, often adjacent one to another. Usually this injury will appear to have been of old standing, and in process of being overcome, if not obliterated, by bark-growth. On uncovering roots, from the stem-base outwards, more or less injury of the same character will be found corresponding in great measure to the time the damage has been in progress.

Roots may manifest it along a course of several feet, both the main ones and their branches being affected. These roots may be ones of the largest girth or ones less than ⅓ in. in diameter.

In a root that has been severely attacked, the entire surface will be occupied by conspicuous meandering channels with roughened margins, each measuring 2 in. or 3 in. in length. These may be more or less occupied or filled with callus that has grown inwards from their edges, as well as with earth. When the attack has been less pronounced these channels in the bark will, of course, be more or less isolate.

There will, however, be commonly more injury than at first meets the eye: since when the channels are first made by the "grubs" or beetle larvæ, and for some time afterwards, they are not only filled with the triturated inner bark, but also covered over and concealed by the outermost layer of this. In this case only a very fine fissure, following the line of each insect's tunnelling, will mark its presence; and this only can be detected on close observation. Therefore, the full extent of injury can only be discerned on scraping off the bark-surface. This, of course, only applies to injury that is not of long standing; for the bark above each insect's working, having already died, sooner or later falls away, and so exposes the damage beneath.

One will be surprised often to find that, although the insects' workings are so conspicuous, much of the bark of the root occupied by the insects is still alive. This is because the grubs always keep their channels distinct; they are not commonly directed so as to produce a ring-barking effect; and, being gnawn slowly through the living under bark (cortex), this will constantly develop wound-tissue, to overcome the direct injury occasioned. (*Vide* "Habits of Insect," p. 76.)

When, in the case of any root, the attack has been made by numbers of insects, and pursued by successive generations of these, and when circumstances occur to prevent natural root-growth, total destruction may be brought about, although it is seldom, if ever, that every root of a tree succumbs. In fact, natural occurrences tend rather to assist the tree to meet insect-attack, or to recover from it, than to "go under."

CITRUS SPECIES AND THE INSECT ATTACK.

All varieties of citrus producing ordinary oranges, as well as those of the mandarin type, are favoured by the beetle. The lemon is also attacked in some instances. [Trees on non-lemon stocks, however, afforded the instances referred to.]

However, not a single instance of Seville orange-tree showing injury was observed; even, when its root-system was explored with a view to its discovery if present—a remark that applied to some of the oldest Seville orange trees noticed, ones aged 27 to 30 years, grown by G. Butt, senr., and W. H. Harvey.*

Obviously these remarks apply, in the case of citrus trees raised by grafting (and commonly "worked trees" are grown in the Blackall Mountain district), to the citrus variety or species forming the stock, since attack is confined with this insect to parts occurring beneath the soil-surface.

As far as could be ascertained, the ordinary sweet orange is the stock on which the round oranges and the lemon are grown, whilst the Scarlet or Emperor Mandarin is grown on its own stock, and the Beauty of Glen Retreat Mandarin on the latter and on its own stock as well.

Our observations tended to show unmistakeably that grafted or worked trees experienced the ill-effects from the attacks of the beetle to a much greater extent than did seedling trees. In fact, no seedling citrus of the round orange type was observed that had been injured by the insect.

Further, that of all kinds of citrus found to be attacked the mandarins were the ones in which noteworthy damage was most remarked.

This incidence of attack had evidently in all cases a more or less direct connection with constitutional vigour, with, too, the manner of root-development—factors however, that might be linked. Thus, deep-rooting trees as ordinarily understood escaped attack or injury, shallow-rooting ones the reverse. [This relation between tree and injury is intelligible on considering the habits of the insect and the behaviour of the tree under attack. (*Vide* p. 79.)]

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* In the case of a single Seville orange tree (Orangery—G. Vining), aged about 18 years, nine root-gauging beetles were found in the soil at the base of the trunk, but no bark injury to the stock, even to a depth of 5 in. to 6 in., had been inflicted. It was not ascertainable whether this Seville was a seedling or worked tree.

CITRUS TREE: AGE AND INSECT ATTACK.

In places where the Root-gauging Beetle is prevalent, it is evidently quite exceptional to find young citrus trees, even of kinds especially liable to attack by it, exhibiting injury by it either above or below ground.

This remark applies not only to young trees growing within a few feet of one whose roots are severely injured, and in which the insect is still present, but to trees even that have been planted in substitution of ones that have had to be removed owing to the damage from beetle-attack and its consequences that they have experienced.

At the same time beetles may often be found in exploring the soil at the bases of their trunks, especially should the surrounding earth have dried out, and the former be still somewhat damp.

A special instance of this was remarked in connection with the affected trees that were growing in the site of the experiment plot in G. J. Butt's orangery. Here five trees of the Valencia late variety had been planted about six years since between old affected ones. Of three of these two yielded examples of the beetle, but no trace of injury.

In other places young citrus trees growing continuously with affected ones on the same land were perfectly "clean." And, as a matter of fact, no young citrus tree that could be said to be injured at all by the insect was met with in the course of the inquiry.

At the same time, the older trees may have their roots still sound and healthy, or, if not sound, then without much evidence of insect attack. [*Note.*—No old tree was wholly extirpated by us, and thus its entire root-system brought under observation.] This was shown on examination of several of those planted originally (about 30 years since) by Messrs. Mills, Dalton, Whitemeyer, G. Butt, senr., and W. H. Harvey. Apparently, however, the majority of the older citrus trees now growing in the Montville-Mapleton area are seedling trees.

NATIVE CITRUS TREES AND INSECT ATTACK.

Examples of the Finger Lime were found growing in the scrub lands not as yet brought under cultivation. However, the root-systems of examples of those on examination gave negative results as regards the presence of the insects. The subjects of this inquiry were, however, quite few in number and young plants only. [*Note.*—The insect was not more prevalent in citrus trees growing adjacent to scrub than elsewhere.]

CITRUS TREE: FACTORS CONTRIBUTORY TO THE INSECT ATTACK.

Citrus trees that experience most damage, as well apparently as ones in whose root-systems the insects principally congregate, are those in which natural decadence—reached in some species or varieties of citrus sooner than in others, and in worked trees earlier than in seedling ones—has commenced, or has been precipitated on its onset and accelerated in its progress by uncongenial soil conditions, defective or faulty horticultural treatment (neglect), soil depletion, and adverse seasons—latterly so noteworthy, rendering the superficial soil unsuitable generally for plant-growth.

At the same time, these factors, or some of them, have operated in the Blackall Mountain area to destroy citrus trees, or nearly to do this, especially in the case of "neglected orchards," without any co-operation of this root-channelling beetle whatsoever.

These contributing circumstances to citrus tree injury in the presence of this root-channelling beetle not only explains the fact that the noticeable injury attributable to it falls far short in its local extension of what its wide occurrence would suggest might be experienced, but at the same time indicates a line of action that, if pursued, would greatly reduce damage such as is now being perpetrated. Fortunately for the citrus-grower the orange, generally speaking, is a tree that it is very difficult to kill, where its destruction is not directly aimed at, but involved in injudicious treatment or default of action of any kind.

THE INSECT AND ITS DESCRIPTION.

The Beetle.—This is a dull black elliptic-oblong strongly convex weevil, having a reddish-clay coloured patch of scales at the base of the wing-covers and on the sides below. It is from 6¾ mm. to 7¼ mm. in length [*Note.*—1 mm. or millimetre is about $\frac{1}{24}$ in.] measuring from the front of the head to the tip of the wing-covers (elytra),

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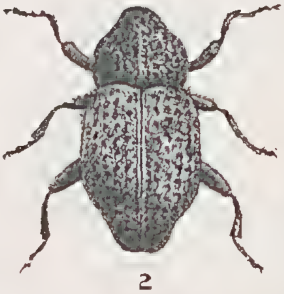

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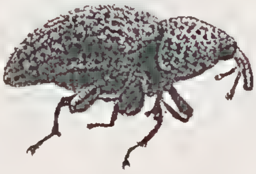

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PLATE 3.— CITRUS ROOT-CHANNELLING BEETLE—*Decilaus citriperda*, n. sp.

Fig. 1. The Beetle—Dormant. Nat. size.

Fig. 2. The Beetle—Active. Dorsal view. Magnified.

Fig. 3. The Beetle—Lateral view. Magnified.

Fig. 4. The Beetle—Dorsal view; wings expanded, 2nd pair pad-like. Magnified.

Fig. 5. The Beetle Larva—Magnified.

Fig. 6. The Beetle Pupa—Magnified.

(*Nos. 2 to 6 from Drawings by H. Jarvis.*)

and rather less than half this in breadth. It has the prothorax and elytra, or two main portions of the body, very distinctly separated or defined, the latter being the broader. This, too, is just twice the length of the prothorax. Both portions are occupied above with very distinct puncturation, the punctures on the wing-covers being in lines, whilst those on the forebody uniformly cover its surface. Its true wings are reduced to mere pads. The beak or rostrum is stout and curved, and, lying in a channel, passes beneath the body. Examples as appearing when photographed are represented on Plate 3., fig. 1.

It does not appear that it is one of the Australian weevils previously made known in entomological literature; much less has it been referred to amongst citrus-injuring insects. It is therefore necessary to append the following technical description of it, that it may be recognised amongst other beetles in the group to which it belongs—*i.e.*, Sub-family, *Cryptorhynchidæ;* Family, *Curculionidæ:*—

TECHNICAL.—*Decilaus citriperda*, n.sp.* Dull black; head beneath brown; antennæ scape and 4 tarsal joints reddish. Elytral surface, prothorax, upper surface of the rostrum, outer surfaces of the femora and tibiæ with appressed linear pale clay-coloured narrow scales; sparsely occurring except on legs; those on the prothorax arising from large punctures; those on the anterior prothoracic border curved upwards; those on the flat faces of the tibiæ in 3 rows. On sides of rostrum in front of scrobes, on joints of funicle, before terminal hook of tibiæ, and forming a dense circular patch near their ends on outer side, non-appressed brown hairs, or hair-like scales. At the base of the elytra laterally, on the outer face of anterior coxa, and on the sides of metasternum larger oblong appressed reddish clay-coloured scales forming in each case a dense patch. In each abdominal puncture an appressed broad scale smaller than those of the upper surface. Pectoral canal glabrous.

Head immersed in prothorax; vertex smooth, finely and remotely punctured; front closely and coarsely punctured; numerous transverse striæ on nitid surface beneath. Eyes hidden by ocular-lobes of prothorax, widely separate, with a narrow smooth orbital ridge, ovate narrowed inferiorly, coarsely facetted. Ocular-foveæ shallow contracting base of rostrum. Rostrum broad flattened slightly widening distally, arched, extending to hind-borders of anterior coxæ, coarsely foveated on upper surface; scrobe having a prominent edge above, wide, directed obliquely beneath the rostrum to lower border of eyes. Antennæ arising at about one-third of its length from end of rostrum; scape not reaching beyond end of rostrum; funicle with 1st and 2nd joints subequal-longer, succeeding joints smaller subequal gradually widening; club oval 1st joint equal to 2nd and 3rd. Prothorax convex rounded at sides, slightly constricted before fore-border; fore-border about seven-tenths length of hind-border prominent and over arching head, its ocular lobes rounded concealing the eyes their cilia short pale-brown; lateral borders angularly extending downwards behind in apposition to anterior coxæ; hind-border bisinuate, prominent in centre, shallowly concave laterally; surface completely occupied with large circular foveæ (thimble punctured) with little if any trace of median line, the punctures at base of ocular lobes in a linear series of about 8-smaller. Scutellum wanting. Elytra convex slightly exceeding 1½ times prothorax in length, slightly wider than it and excavated in front; sides lowly descending; convexly declivous from about ½ length, narrowed and somewhat constricted towards apex that is rounded and tumid; nine longitudinal rows of deep foveæ each with a central granule-like body, a shorter similar row of 5 foveæ only behind shoulder, the foveæ oblong in outline, slightly smaller on disc

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* The present insect was formerly provisionally assigned by the writer to the allied cryptorhynchid genus *Poropterus*. (Report Entomologist, Department of Agriculture, Queensland, 1918-19.) It has been transferred to *Decilaus*, Pascoe (Trans. Ent. Soc. Lond., 1870, p. 205), as interpreted by A. A. Lea ("Revision of the Australian Curculionidæ belonging to the sub-family Cryptorhynchides." Proc. Lin. Soc. N.S.W., 1898, Pt. 2, July, 1918, pp. 190-192.) It is evidently distinct from any of the species of *Decilaus* described or dealt with by Lea in this memoir. Again, it is not one of the beetles described by him subsequently under this generic name in a paper read before the Royal Society of South Australia (*vid.* Trans. Roy. Soc. S.A., XXIX., pp. 230-6, 1906.)

and becoming greatly reduced in size on hind declivity, where obscure punctiferous striæ replace them; the interstices about equal in breadth to the foveæ are plane (slightly convex on hind declivity) and occupied with punctures of two sizes, the larger ones setigerous and tending to form interstitial lines. Under surface: Pectoral canal, a wide channel deepening behind extending to mesothorax bounded by projecting lateral borders of prothorax and by coxæ of front legs; mesosternal receptacle bounding channel behind in form of a perpendicular narrow plate slightly concave on its upper edge and in front; base of mesosternum rising quickly with a sharp ridge from posterior border and expanding into receptacle [as in genus *Elæagna*]; metasternum as long as 1st abdominal segment and widely excavated behind to receive its process, narrowly projecting in front between middle coxæ, sides coarsely foveate; metasternal episternum narrowed anteriorly; abdomen with discrete large foveæ, 1st segment with its median anterior projection broad and rounded, without lateral channels, segmental sutures complete and well defined, 1st and 2nd segments (less projection of 1st) subequal, longer than each of 3rd and 4th, these equal, 5th segment equals 3rd and 4th together. Femora short coarsely net-punctured externally, stout, bent, non-dentate, each with a groove on inner surface in which tibia is received in repose, hind-femora not extending beyond 4th abdominal segment. Tibiæ short, compressed, upper edge narrow, 2 low ribs separating 3 rows of setiferous punctures on each plane surface, hind tibia with an angular projection on upper border near base beyond which this is shallowly concave, each tibia with a sharp curved strong claw-like tooth at extremity below preceded by a brush of hair. Tarsi, 3rd joint broader than others with rounded well-separated lobes, joints 1 to 3 with hair pads beneath, claw-joint narrow glabrous, claws divergent. Length, 6 mm. Individual range of length from 6.5 to 7.5 mm.

Hab.: Blackall Range and Buderim Mountain, S. Queensland.

Larva (*"Grub"*).—This when full grown is larger than the dimensions of the beetle would suggest. It is of a very pale-yellowish colour, and unclothed. It is of nearly even breadth, though rather widened in front, and measures about five times as long as broad. The seven body-segments behind the head are well defined, especially at the sides; those comprising the terminal third of the body less so. Broad corrugations marked out by furrows also cross the body. On each side beneath are two rows of low rounded prominences each bearing two scarcely discernible hairs that serve the purpose of feet. Posteriorly the body ends with suddenness roundly in a little protuberance, bearing a row of six or eight weak hairs. The round anal orifice is beneath this. In front the body suddenly narrows to half its width and overhangs slightly the head. This measures 2 mm. across and is somewhat longer. It has parallel sides. It is of a horny brown colour, with the fore-border of the front the cheeks and jaws very dark castaneous brown. The labrum or upper lip is rounded in front and ends in a short brush of glistening hair. It has two little depressions behind its fore-border, each giving rise to a single hair also. The mandibles are stout and prominent, with even concave gauge-like cutting edges. The submentum is large, almost circular, with a triangular indent in front for the mentum. The maxillæ are stout and conspicuous on each side. The maxillary and labial palps are two-jointed; the basal joint in each being similarly stout. Length, 15 mm. by 3 mm.

Pupa (*"Chrysalis"*).—This, as is usual in beetles, foreshadows in appearance the beetle or perfect insect. It is elongate-oval in general outline rather longer than twice its width. The thorax and abdomen are equal in length. The prothorax is shaped as in the beetle; its fore-border is marked by a row of four prominent dark coloured projections, each usually bearing a stout bristle; a row of similar but weaker ones cross the middle; and two in line are behind the outer of these on each side. Both meso and meta notum—the latter rectangular—widely separate the wings and wing-covers, each having a transverse row of four short bristles. The wing and wing-covers extend backwards to the fourth abdominal segment and slope downwards and outwards. They are sub-equal, or the wings are the longer. [*Note.*—In the beetles they have undergone no extension and increase in size, whilst the wing-covers have largely developed.] The abdomen narrows convexly to its extremity. Its nine segments are well defined, especially above. Five black circular spiracles occur. Between the lines in which the spiracles are placed along the hind borders of each abdominal segment above is a row of very short stout black spines. The terminal segment of the abdomen ends in two prominent stout spines, each directed inwards. Beneath the pupa exhibits the organs folded as in the adult beetle: Four very short bristles occur on the head in front, about twelve on the upper surface of the backwardly directed proboscis or rostrum. Length, 8 mm. by 3.5 mm.

THE INSECT: ITS HABITS.

The Larva.—The beetle when about to oviposit gnaws a small depression or hole (.5 mm. in diameter) in the bark at a spot where living tissue occurs beneath it, and lays its oval-shaped egg therein—one egg in each. The small larva, on hatching out from this, at once commences to mine, but apparently in no fixed direction, upwards or downwards, the channel so formed increasing in width from 1 mm. (½ line) to 6 mm. (3 lines). A single larva may mine to a length of 2 in. or more, but the length of stem in which this takes place is much less, since the course pursued is generally waved or serpentine, the insect turning aside in meeting any obstacle such as the origin of a secondary root or other beetle-larva's working, although in the case of the latter it will often proceed alongside of it for some distance without, however, the channels of the respective insects ever merging. The channel mined, again often turns on itself under the circumstances mentioned—thus, after proceeding forward along the roots, turning towards its extremity. Further, it is not circular in section, its width being at least three times its height. It is confined to the cortex or bark of the root, extends to its full depth, being carried along the surface of the wood that is bored. Outwardly it is covered by the outermost thin layer of root-bark, and thus is at first only brought to light on removing this; although, as this bark, to the extent undermined, soon dies and fissures, an irregular longitudinal cleft following the course of the insects working will discover its presence. The beetle larva always lives in the forefront of its mine, in a small empty cavity whose floor is the outer surface of the wood, and whose walls are the living bark tissue it has just excavated. This scarcely exceeds its dimensions in size. Behind the insect the channel is filled continuously with chewed-up tissue, this matter being composed principally of short lengths of woody fibre (liber) and not of fœcal particles (frass). It is too well compacted together, not falling away when exposed. It is noteworthy, again, that the direction pursued by the beetle larva in burrowing is seldom directly transverse to the root, and much less frequently, if ever, does a single insect girdle it. This remark especially applies to the larger of the roots in whose bark it operates. In a smaller root measuring only 10 mm. in diameter a channel, after proceeding forwards and then curving partly across, wound around till it had passed its starting point, the egg-cavity, but then this was 5 mm. above, and thus was continuity of the living bark secured. This was the nearest approach in ring-barking effected by one of seven beetle larvæ—representing two generations—that were or had been operating in a root length of but 10 cm. This is one significant fact in the explanation of the relatively small injury experienced through root infestation on the part of the insect. Others will be alluded to. (*Vide* "Plant recuperation under injury," p. 79.)

The Pupa.—When the beetle larva is full grown, and has reached the proper stage of growth, it widens its workings suddenly from a channel of 6 mm. in width to a chamber—still within the root-bark tissue—16 mm. or more across. This for the most part is filled up, as is the channel; but now it gnaws downwards into the wood, forming a shallow horizontal oval cavity therein. With the woody fibre it thus removes, bent and compacted around, it now walls in this cavity so as to form a pupal-chamber, whose floor is the bare wood, and that is covered above by the root-bark. This cavity measures from 8 to 9 mm. in length and is 5 mm. across. Within the pupal cavity the insect now transforms, developing into a pupa, as described (*vide* p. 76.) The pupa in turn changes whilst still within this cell to the perfect insect or beetle. This, however, does not immediately issue forth. It is at first a pale-brown colour, but it soon darkens with age. When the time has arrived for this act, the beetle makes an irregular hole through the bark that has covered the chamber in which it has arisen, and so effects its exit.

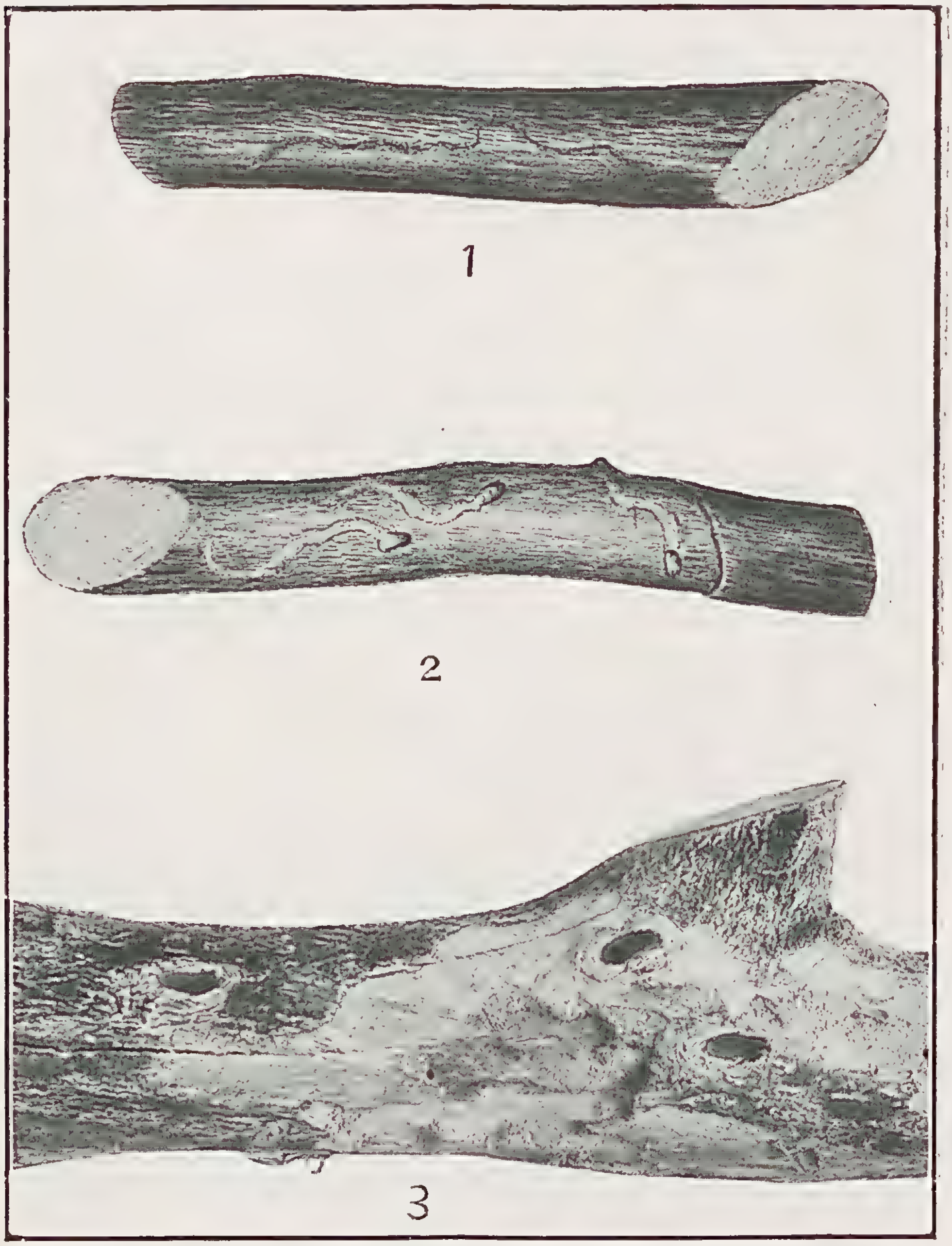
The individual beetles are long-lived. There are grounds for concluding they are at least two-brooded, adults coming forth in the spring (September) and again in December-January, but this longevity referred to causes the adult insect to be discoverable during a greater portion of the year.

The insect is nocturnal in its habits, hiding in the soil during the day. When it comes forth after nightfall it crawls slowly over the surface. The circumstances under which it comes into being or generally is met with, the fact that its body is almost invariably soiled with earth particles, and its special structure, together render it certain that it possesses some faculty for digging its way through the soil, either upwards or downwards, although usually availing itself of fissures and clefts therein for its more concealed movements.

It is commonly to be encountered during the day in the soil immediately around the base or collar of the orange-tree trunk, especially should the soil here be slightly moist, although somewhat free and open. Here it may occur at a depth of between 2 in. and 6 in., possibly below this. Usually evidence of old injury by root-channelling beetles on the bark of this part of the orange tree is found where the insects are encountered, but not always so. The beetle may commonly be found within the limits of its haunts, under stones and logs lying on the surface somewhat embedded in the soil.

Usually when first seen it is simulating death, with its snout tucked up well under its body in a special groove for its accommodation and its limbs folded.

In addition to the situations mentioned, the insect is to be met with along the courses of the roots radiating outwards from the trunk-base of citrus trees, and associated now with definite injury. It does not, however, favour those roots that occur at greater depths than a few inches from the soil-surface.



Peate 4.—Citrus Root-Channelling Beetle—*Decilaus citriperda*, n. sp.

Fig. 1. Beetle Larva injury—Linear crack in bark following course of larva channel. Nat. size. (*Drawing by H. Jarvis.*)

Fig. 2. Beetle Larva injury—Channels (burrows) produced by young beetle larva. (*Note.*—Exposed on removal of bark surface.) Nat. size. (*The same.*)

Fig. 3. Beetle Larva injury—Channels produced by full-grown larvæ and showing three empty cocoon chambers. Nat. size.

(*From Photograph by Mr. W. J. Sanderson.*)

Issuing from the pupa chambers, already described as constructed in the wood and bark at the surface of the roots—several, it may be, from spots on the same one not far apart (*vide* Plate 4, fig. 3)—the early life of the newly-arisen beetle is at present somewhat a matter of conjecture. Insomuch as successive generations of beetle-larvæ arise from eggs lain at intervals on the same area of root-bark, or in different ones adjacent to one another in one length of root, one may infer that, rather than proceed to the soil-surface, they pair, and when female insects return to the roots through the soil again, mating taking place on issuing from the pupa-chambers, and so the beetle works its way along the root surface to a fresh and convenient spot where its eggs may be placed singly, as we have seen, in the bark. How many of these eggs each female insect lays is as yet unascertained, but probably less than twenty. We have found in small areas of bark young larvæ of the same age, and occupying channels of identical size and length (*vide* Plate 4, fig. 2), to the number of but six, and nine in instances, evidently the outcome of separate acts of oviposition by two beetles. Where old larval channels whose bark roofs have fallen away, and are not fully filled in by wound-tissue, occur, the passage of the beetles along the roots is easily effected; whilst again, with the contraction of the soil, on the rising of its temperature or the reduction of its moisture-content, arise openings adjacent to the root surfaces that again may be availed of for this purpose. The fact that, especially in the case of a larger root, the larval mines or channellings may at times be almost confined to one side of these organs, usually the lower side, may be accounted for by the presence of such by-ways.

As we have seen, the beetles have no functional wings, these organs being represented by small pads, and that, therefore, they do not fly but crawl only. This and the facts above arrived at explain the concentration of the beetle attack on isolated trees in an orangery, and their long association with these trees, grown as they are isolatedly. It also explains the fact that beetle attack is confined to limited areas, and is very slow in becoming distributed. Thus, in an instance of its pronounced local development, and where trees obviously attacked could be counted by the score—a spot where this root-channelling beetle must, in fact, have been present for years—special investigation proved that an ordinary road only served to separate clean and beetle-ridden areas, only a single tree being found to harbour but a few of the beetles in the former.

It may be affirmed that the beetle is a denizen of the local scrub, and is associated with the roots of one or more kind of the trees composing its flora. The growth of these continuously in an area would explain the general distribution of the insects therein, as opposed to their segregation in the root-system of isolatedly growing trees as we find in the orangery. Thus, in their native haunts, they might at first elude detection, as has been the experience in this inquiry.

The food of the beetle has not been ascertained, but the well-developed mandibles which are comprised in the mouth organs that terminate its rostrum or snout are, as we have seen, well adapted for gnawing into bark-tissues. The grub itself—whose mining operations are confined to the living bark or cortex of the citrus tree roots, and whose life and growth takes place invariably therein—we may infer, feeds on the plant tissue that this yields. The inference, however, is not wholly warranted. The floor and walls of the chamber at the head of the channel it has gnawn, and in which it resides, produce constantly little droplets of gum that reddens as it dries, and it fills its chambers not with the by-products of digestion, but with triturated fibre principally. We know little of the feeding habits of that section of the weevil family of beetles—the *Cryptorhynchidæ*—to which this citrus root-channelling species belongs; but it is an ascertained fact that certain wood-boring beetles of another family—the *Scolytidæ*—do not feed upon the substance of the tissue that contains their tunnellings.

The Citrus Tree under Beetle Attack: Its Reaction.

In addition to the special gum-exudation above alluded to, the roots of the citrus trees under ordinary circumstances of growth react, on being gnawn into by the beetle-larvæ, in a manner that tends, often successfully, to secure them against final destruction. Under conditions of ordinary vigour, the living bark beneath the root-surface or channel inhabited by the beetle-larvæ being commenced, and continuously thenceforth, functions in a way to overcome injury. On the sides of the channel, and on its base to a less extent, issues, from the active cambium and other elements of the cortical tissue, a gelatinous substance that is of an orange colour, and hardens on exposure. (This is readily seen on uncovering the recently made channel.) This lining the channel or tunnel not only evidently prevents the entrance of tissue-destroying fungi, &c., but, itself becoming organised, forms plant-tissue also, serving in the end to replace that that has been broken down by the beetle-larva in its working. In fact, it is the commencement of the formation of wound-tissue or callus that, under favouring circumstances of the orange tree's growth, will gradually close the channel

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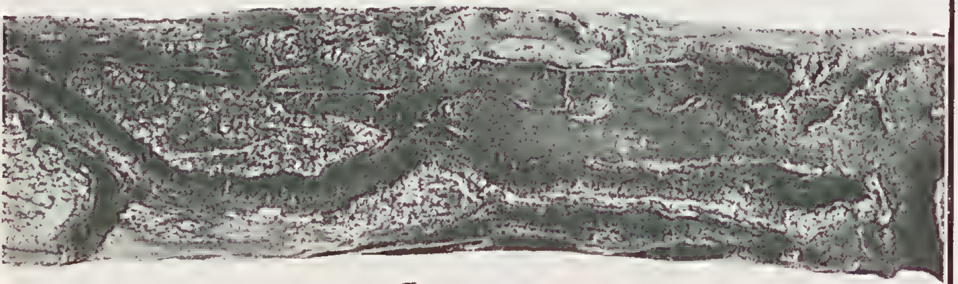

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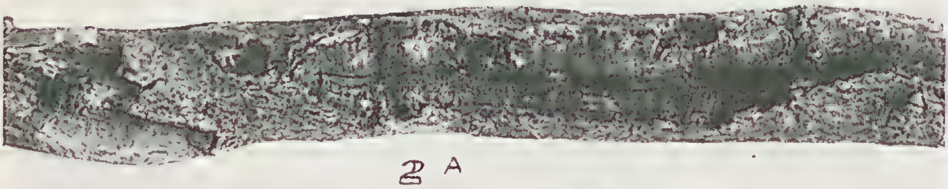

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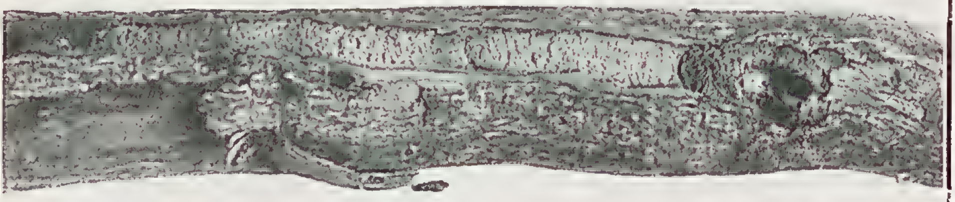

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PLATE 5.—CITRUS ROOT-CHANNELLING BEETLE—*Decilaus citriperda*, n. sp.

Fig. 1. Beetle Larva injury—Large root, showing much damage. Nat. size.

Fig. 2. Beetle Larva injury—Natural recovery on being injured by growth of wound-tissue or callus. (*a*) Channels partly filled up. (*b*) Entirely occupied.

Figs. 3*a* and 3*b*. Beetle Larva injury—Injury not overcome. No wound-tissue formed (*a*) Single channel. (*b*) Contiguous channels or burrows.

(*From Photographs by W. J. Sanderson.*)

as it has been made, or if it leave the channel open to a slight extent the floor of this, drying out superficially, will itself serve to protect the living wood beneath from further destructive change.

When this happens, the citrus experiences little or no permanent injury, and it can withstand much ordinary mechanical damage, especially when, as in the case of this beetle larva's attack, girdling of the root ("ring-barking") is rarely effected, even when no wound tissue or callus is produced, as sometimes occurs.

On examining the characteristic injuries exhibited by citrus tree roots that have been injured by this beetle-larva, one will observe the insect's channellings in the bark occupied with the wound-tissue in all stages of completeness. (*Vide* Plate 5, figs. 2 *a* and 2 *b*.) This is especially so, since the callus lining, on growing inwards and upwards along the insect's tunnel walls, pushes off the thin layer of outer bark that has covered them over above. It also results in the old workings being marked out by ridges on the bark's surface that take years of root-growth to obliterate. (*Vide* Plate 5, fig. 1.)

Under certain circumstances this wound-tissue or callus does not develop, and then fatal injury to the root may result:—(1) When two beetle-larvæ channels or more lie alongside one another, sufficient breadth of intervening tissue may not have been left, so that instead of developing callus it will dry out and die. Thus, considerable areas of exposed wood may result that are incompatible with healthiness. (2) When the usual seasonal rains fail, and the soil dries, the roots of the attacked citrus trees lose their turgour and vigour owing to their not being able to secure water to replace that lost in transpiration of the foliage. Then no new tissue is produced, and this callus lining the beetle-larvæ's tunnellings is absent. The wound inflicted in the living bark therefore remains open, and ill-effects on the root-system and tree's health generally are experienced to the fullest extent that can follow beetle-larvæ attack. This failure in wound-tissue production is shown on Plate 5, figs. 3 *a* and 3 *b*.

The reaction of the root's cortical tissue to the insect's tissue-destructive operations above detailed differs in degree amongst the several kinds of citrus—a fact that may explain the different extent to which they severally suffer when subject to them.

But it especially accounts for unusual destructiveness under local climatic conditions, characterised by a failure in the seasonal rainfall, such as had been experienced for months past, when the present inquiry was instituted.

REMEDIES.

Experiments so far conducted, valuable as they have been, have not discovered a mode of treatment that can be relied upon for successful results

The earliest treatment resorted to appears to have been the use of salt applied to the soil immediately around the base of the tree trunk, and which, it would appear, was originally suggested by the late S. C. Voller, Instructor in Fruit Culture. The salt derived from meat-packing houses has been generally that employed. J. Snowdowne, who applied this remedy extensively, treated, as he testified to us, forty trees on a single occasion. He employed in this work, too, also sulphur and salt together, combining them in equal proportions, and using half a kerosene tin full (2 gallons) to each tree. He, however, did not get results that were satisfactory to him (but probably better would have been obtained had this treatment been practicable when the trees had not already exhibited the injury that they then had already experienced —H.T.)

Similarly, the experiments inaugurated by the Director of Fruit Culture, A. H. Benson, as already alluded to, and that varied considerably in detail, have been inconclusive from our point of view as regards indicating the line of direct attack to be followed. These experiments, however, were most useful in one respect, in demonstrating that by the adoption of the proper treatment of citrus trees, as dictated by up-to-date horticultural knowledge, even severely injured trees could be greatly improved in condition. The earlier of those experiments consisted in the use of fungicides (iron sulphate, corrosive sublimate, &c.), and not dictated by entomological science, and an appreciation of the factors determining the injuries, could scarcely be expected to yield successful results. The judicious use of fertilisers and tree-pruning effected, however, the amelioration referred to.

Further experiments are needed, however, as a guide to the best procedure. Only suggestions, therefore, can now be offered as to the lines that these should follow:—

(1) The insects evidently gain access to the roots at the base of the tree-trunk or collar. It would appear then that they might be prevented from gaining this access by placing in the soil here some repellant substance—*e.g.*, one containing crude naphthalene, such as "Vaporite-Strawson," "Fumas," or "Apterite," or the spent lime from acetylene gas production, or some other strongly odorous body.

(2) When already occurring in the orange tree roots themselves, the insects might be assailed by some powerful insecticide that acts in the form of a vapour. Unfortunately, a solution of potassium or sodium cyanide (Mamella process) is not available. Although so destructive to other beetles, the present insect, being most resistant to hydrocyanic acid vapour, is little affected by it. Probably, however, it will be found to be destructive to the beetle-larvæ, even when occurring in their channels in the bark. The same remark applies to bisulphide of carbon, although for other reasons. It is, however, considered that the new insect fumigant (Para-chloro-benzine), that has been found to succeed where other fumigants have failed in destroying root-frequenting insects, will be the best of these forms of insecticides to employ. A supply of this should be shortly obtainable in Brisbane, where samples only so far have been available for use in insect-destruction.

(3) Owing to the fact that the bark-damaging beetle-larva is accessible in its "burrow" when the soil is dry, owing to the fissuring of the bark that covers it, it may be possible to reach it even with some fluid contact insecticide not itself a plant-tissue destroyer. Kyanit, which contains a proportion of common salt, if obtainable, might be used as one of these. Under some circumstances it acts as an insecticide, and may be employed in this connection, especially since it is a promoter of root-growth—a desirable feature in any remedial treatment.

(4) It has been already shown that the citrus tree roots suffer only under the beetle-larva attack, or principally so when they have ceased to grow or exhibit their normal vigour and internal functional activity. Accordingly, the judicious use of stimulating fertilisers, irrigation, and correct soil treatment generally is indicated as a remedy not only preventive of insect attack to some extent, but of the injury to the tree that results from this.

(5) Any treatment that tends to overcome the ill-effects on the root-system of drought during the summer months, or when the growing period occurs, will prove beneficial or sufficient.

ACKNOWLEDGMENTS.

Our indebtedness must be confessed to the Director of Fruit Culture, Mr. A. H. Benson, and the Instructor in Horticulture, Mr. J. Mitchell, for assistance in the field, and for obtaining material for examination. Also to the several citrus-growers of the Blackall Range for facilities in conducting the inquiry.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigations from Dr. Illingworth:—

Everything here is practically at a standstill, since we are in the midst of the worst drought of my experience. From all that I can learn, it equals that of 1915. The cane is suffering in most places, especially the plant, which is very yellow and shrivelled. I have had to forego an extensive line of planting experiments, which I had planned for Greenhills, to test out thoroughly the value of poisons for the control of grubs.

Of course no insects are in evidence, so "it's an ill wind that blows nobody good"; probably many of the beetles will not be able to emerge. Digging to a depth of 3 ft. in the infested fields at Greenhills disclosed that they are badly rubbed, which indicates that they have been waiting to escape for months; indeed, I found some already changed to beetles in the pupation cells when digging last June. This long tedious wait saps their strength and curtails their activities after the rains come, even if they do have enough energy to get out of the ground. In line with this, it is now pretty well recognised that the drought of 1915 settled the beetle question on the Herbert River. There has been no general infestation in that district since that time. Let us hope, then, that we shall reap some benefit from the hardship.

A few of the other districts have been more favoured with regard to rainfall. Mossman, in particular, seems to have fared well, as usual; and, furthermore, only a small crop of beetles has emerged. There were very few grubs in evidence in that district last season, so I did not estimate that they would get many beetles. Babinda, too, is most favourably located as to rainfall, and since this is new land the grubs have not been very destructive there. I have made two visits to this section recently, and found the cane in excellent condition—in fact, a drought year appears to be favourable to the well-being of that district. The Johnstone River, on the other hand, which usually has heavy rainfall, is suffering like ourselves.

ON THE VALUE OF ARSENIC FOR CANE GRUBS.

Mr. H. J. Castor, at Mourilyan, has secured a successful crop from land which he treated with white arsenic at the rate of 15 lb. to 20 lb. per acre. This is especially interesting, since this land has previously failed—the grubs eating the cane right out of the ground. Unfortunately, he kept no check plots, so we are unable to judge just how much of the benefit was due to the poison.

THE BEETLE BORER OF SUGAR CANE.

Investigation of this pest at Mourilyan showed that it is thoroughly established throughout the area. Of course, most of the cane is now cut; but the old channels of the borers are much in evidence in the discarded sticks, and the beetles are easily found in most of the fields.

The farmers there generally recognise the importance of planting clean seed. However, as I pointed out in a former report, there is danger of leaving this seed in the field any time after cutting, for the beetles are attracted to the cut surfaces, where they deposit their eggs. In one instance, a Mourilyan grower left his plants in the field for a few days on account of rain. When planted, the strike was so poor that he investigated, and found that almost every plant was riddled by the borers.

BREEDING OF THE MUSCARDINE FUNGUS.

I have had a large cabinet constructed at the Mulgrave Mill for this work, built on the plan of that illustrated in Trinidad Circular No. 8. This cabinet is about 6 ft. high, with ten shelves of galvanised iron 2 ft. 9 in. square. The food for the growth of the spores is deposited on these shelves and subjected to sterilisation by steam before inoculation with pure culture of the disease organism. Several bushels of the spore-laden material can be developed in this way, and this is scattered in furrows throughout the grub-infested fields. Insects coming in contact with these spores, under moist, cool conditions, become diseased and quickly succumb. Hence the idea is to see if we can multiply the disease so as to form an epidemic among the grubs in fields which are badly infested; and, furthermore, to scatter the disease in other districts where it is not now present.

Under favourable conditions during 1917, I found fully 30 per cent. of the grubs destroyed by this fungus in some fields at Greenhills. It will be interesting to see if we can increase the contagion.

The spores develop on any starchy substance; hence rice was used in this work in Trinidad. Here, however, the present price of rice is prohibitive; and I have cast about for other substances. Cornmeal was used in this sort of breeding work in Illinois, and I found that it does even better than rice, if finely ground and mixed into a thick mass after cooking with steam. The mat of spores on this substance is perfect. I also tried flour paste and sliced sweet potatoes, and, though they do fairly well, they are not nearly as satisfactory as the cornmeal.

Under laboratory conditions here, the fungus begins to show as compact white spots one day after planting, and signs of the green spores are noticeable in the centres on the second day; within a week, the whole substance is a compact mass of the green fruiting.

The Horse.

THE MULE *V.* THE HORSE.

By J. A. RUDD, L.V.S. (Melbourne).

The American draught horse, as I saw him in France, arrived at a time during the war when there was more and better shelter, and he was therefore less exposed to the rigours of the winter; and this fact would, no doubt, have some bearing on his freedom from respiratory affections as compared with Shires and Clydesdales bred in the British Isles. He was not as sound as our Australian horses, ringbones and side bones being very prevalent. The majority were flatfooted, and suffered in consequence from bruised soles and punctures, and seemed to be very prone to ophthalmia in comparison with other breeds of draught horses.

The Australian Clydesdale was, in my opinion, the best type of draught horse for heavy haulage under all conditions.

They stood hardship better than other horses, and, as a majority, had better feet and legs, and, taken all round, were of better conformation and tougher constitution. The Australian thoroughbred was also a very useful animal, and did all that was required of him, and was capable of doing long stages without water. The Suffolk Punch was too small for heavy draught work. The majority, as I saw them, were flat-footed and round boned. In the soft fen country of England there is no doubt that they would make good, and prove a very useful type of horse, but they were hopeless for heavy haulage on hard roads, and they seemed to me to be top-heavy and overbalanced. The same applies to the Percheron in France. Lameness and skin soreness seemed very prevalent among them.

I do not think we can do better than stick to the Clydesdale as the best all-round horse for heavy work in Queensland under all conditions.

We should endeavour to encourage the breeding of the small, thick, low-set type of horse as being more handy than the leggy animal, and easier to nick in an artcross.

The North American mule did much useful service as a transport and pack animal, and helped a good deal. He was handy under certain conditions, but fairly susceptible to epidemic disease. He was very apt to give one a surprise when it was least expected. There are certain advantages in the breeding of mules and also disadvantages.

If the former outweigh the latter, then this Department may rightly give some consideration to the breeding of mules for work in the sugar districts of this State, and encourage mule breeding as an industry by importing a good American jack.

A good American jack donkey should stand 14.2 h.h., be dark-brown in colour, wide in the chest, straight along the back, and not cow-hocked. He should be free from hereditary disease, should stand square on his feet, being neither overshot in front nor sickle-hocked behind, and should move true at the trot with good action, and above all descend from a sire whose ancestral qualification showed tractability and docility. A good jack costs about £300 in America, but it may be possible to procure one in Victoria, bred in that State from pure American parents, at a lesser price or one-third the above cost.

Advantages.

1. A mule, which is a hybrid and a cross between a jack donkey and a mare, seldom inherits defects from an unsound mare, *e.g.*, mares which are unsound will, with very few exceptions, breed sound mules.

2. Mules come into work earlier than horses. At two years of age, a mule could do a fair amount of useful work and will last, with ordinary care, until he is thirty years of age.

3. The mule will live and thrive on sugar-cane tops, and will require less food, and will do better on rougher food than horses.

4. They stand heat better and will do better work on Northern areas.

5. They will haul the same load as easily as a horse twice their weight, at a pinch, and will always, weight for weight, haul more than a horse.

6. They cost less to keep, and they do not require the same care as horses.

7. A jack donkey costs less to keep than any other sire.

8. Mules have strong hoofs with a thick wall and sole, and the horn is of greater density than in the majority of horses. If care is taken of their feet until they are four years of age, they can run on almost any road without being shod, but once they are shod, it is difficult for them to do without shoes.

9. It is easier to purchase a sound jack than a sound stallion.

10. The jack donkey as a sire is always more prepotent than a stallion, and the percentage of fertility is always higher when the jack donkey is used as a sire.

Disadvantages.

1. It is not easy to purchase a good jack donkey.

2. Mules, as a rule, are more subject to epidemic disease than horses.

3. They cannot with safety be allowed to mix with horses on a farm.

4. They are more difficult to handle, and not so tractable as a horse.

5. If a mule makes up his mind to break out of a paddock, there is no fence on a farm that will hold him. The upkeep in fencing is therefore greater, but a mule's remarkable immunity from accident should be taken into account.

6. He does not look as well as a horse and cannot be depended on to the same extent.

7. A mule, being hybrid, cannot be used for stud purposes, therefore his value in this respect is *nil.*

8. An ill-tempered jack donkey will reproduce this bad fault in his progeny.

9. Docility and tractability in a mule depends to a large extent upon and varies with the individual who attends him; and once he is ruined, he can never be reformed. Under any circumstances it takes a mule some weeks before he will take kindly to a change of attendant and surroundings.

10. A mule makes the best pack animal procurable, and will stand the work under heavy loads in hilly country, and under all conditions, better than horses.

General Notes.

SOCIETIES, Etc.

Sarina.—The Plane Creek Canegrowers' Association (Mackay). P. Olsen, Secretary.

Mackay.—The Homebush Canegrowers' Association. Emil Fox, Secretary.

Mackay.—The Oakenden Canegrowers' Association. James R. Waters, Secretary.

THE FIRST AEROPLANE FLIGHT FROM ENGLAND TO AUSTRALIA.

The following excellent account of the daring flight of Captain Sir Ross-Smith, accompanied by his brother, Sir Keith Smith, Sergeant J. Bennett, and Sergeant Shiers (all Australians), from England to Port Darwin, as given by the "Producers' Agency," Sydney, is a record which should be read by all Australians, and we place it before our readers for their information and that of the rising generation:—

In 1919 the Commonwealth Government offered a prize of £10,000 to the pilot who first accomplished a flight in an aeroplane or seaplane from Great Britain to Australia within 720 consecutive hours, before midnight of December 31st, 1920. The principal conditions were:—A complete aircraft to be entirely constructed within the confines of the British Empire; the pilot and crew to be of Australian nationality, in accordance with the laws of the Commonwealth; entrance fee £100; only one aircraft to be used throughout the flight; a start to be made from Hounslow aerodrome or Calshot seaplane station; the point at which the competitors finish to be in the neighbourhood of Port Darwin; towing on the water not prohibited, but the total distance of such towing must not exceed 100 miles, of which not more than 50 miles must be consecutive.

Captain Ross-Smith (son of the manager of Mutooroo Station, S.A.) enlisted in August, 1914. He, with his brother Keith and two others—viz., Sergeant Shiers, of South Australia, and Sergeant J. Bennett, of Melbourne—left Hounslow on November 12th, 1919, on a 360 horsepower Vickers Vimy, of the type used in the flight by Captain John Alcock across the Atlantic last June. Northern France was traversed through snow, and he reached Lyons in 400 minutes. He left there on the 13th, and reached Pisa the same day. Rome was made on the 15th, and Taranto on the following day. He left for Crete on the 17th; this was the worst trip experienced. He flew 500 feet above the ground through mist and rain, following the coastline of Greece. On the 18th he left Crete and reached Cairo. He flew to Damascus on the following day, the 19th. On the 20th he left in rain, climbed among the clouds, and headed for Bagdad, but was forced to land at Ramadie. From here to Basra on the Persian Gulf was his first good flying day. Delhi was reached on the 26th. He left there next day, arriving at Calcutta on the 28th. From there he proceeded to Akyab. He arrived at Rangoon on November 30th, followed one hour later by Etienne Poulet, a French aviator, who left Paris on the 15th October, or 29 days before Captain Ross-Smith. Poulet was not a competitor for the Commonwealth prize, but he was endeavouring to reach Australia on his own account; but many people looked upon him as a competitor with Ross-Smith, or as a pacemaker with him. Poulet, in a Cauldron biplane which had seen long service, and was of small design, did remarkably well up to Karachi, where his mechanic, Benoist, contracted fever, and Ross-Smith, making long flights, including one of 660 miles from Suda Bay to Cairo, rapidly gained on the Frenchman in the journey across Southern Asia. Poulet eventually retired from the flight, owing to his machine being put completely out of commission by the breaking of a piston.

From Rangoon, Ross-Smith made fast time *viâ* Singapore, Java, and Timor Island to Darwin, which place he reached at 3.40 p.m. on Wednesday, 10th December, covering the journey within 28 days in the flight from England to Australia, the longest in the history of the world. The actual flying time from the start was 125 hours, or 5 days and nights and 5 hours. The average speed was 85 miles an hour.

The aviators were entertained at dinner at the Victorian Hotel, Darwin. The Administrator said that "practically fifty years ago a cable was brought to Darwin, which first brought Australia into touch by cable with the outside world. That day it had been the landing-place of the Australian aviators, whose skill and daring had forged a new link between Australia and the outer world." In a cable it was stated that "three cheers had been given for Ross-Smith in the House of Commons."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY, 1920.

Article.		JANUARY.
		Prices.
Bacon	lb.	1s. 4d.
Barley	bush.	...
Bran	ton	£12 12s. 6d.
Broom Millet	"	£40 to £60
Broom Millet (Sydney)	"	£50 to £70
Butter (First Grade)	cwt.	...
Chaff, Lucerne	"	£15 to £18
Chaff, Mixed	"	...
Chaff, Oaten	"	£14 to £18
Chaff, Wheaten	"	£12 to £15
Cheese	lb.	1s. to 1s. 0½d.
Flour	ton	£15
Hams	lb.	2s. 4d.
Hay, Lucerne	ton	£8 to £12
Hay, Oaten	"	£15
Hay, Wheaten	"	£10
Honey	lb.	7d. to 7½d.
Maize	bush.	8s. 6d. to 10s. 1d.
Oats	"	...
Onions	ton	£15 to £19 10s.
Peanuts	lb.	7d. to 10d.
Pollard	ton	£13 2s. 6d.
Potatoes	"	£20 to £54 15s.
Potatoes (Sweet)	s. bag	9s. to 11s.
Pumpkins (Cattle)	ton	£24 to £25
Pumpkins (Table)	doz.	12s. to 13s.
Pumpkins (Table)	sack	25s. to 30s.
Eggs	doz.	1s. 4½d. to 2s. 2d.
Fowls	per pair	8s. 6d. to 12s.
Ducks, English	"	6s. to 7s.
Ducks, Muscovy	"	9s. to 12s.
Geese	"	11s. to 15s.
Turkeys (Hens)	"	15s. to 18s.
Turkeys (Gobblers)	"	20s. to 50s.
Wheat	bush.	7s. 6d.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	3s. to 15s.
Beetroot, per dozen bunches	1s. to 2s.
Cabbages, per dozen	3s. to 23s.
Carrots, per dozen bunches	9d. to 1s.
Cucumbers, per dozen	1s. to 3s.
Lettuce, per dozen	6d. to 1s.
Marrows, per dozen	3s. 6d. to 5s.
Peas, per sugar-bag	6s. to 16s.
Potatoes (Sweet), per sugar-bag	7s. to 9s. 6d.
Pumpkins (table), per sack	25s. to 30s.
Tomatoes, per quarter-case	7s. to 16s. 6d.
Turnips, per doz. bunches	3s. to 4s.

SOUTHERN FRUIT MARKETS.

Article.	JANUARY. Prices.
Bananas (Queensland), per double-case	22s. to 25s.
Bananas (Tweed River), per double-case	20s. to 25s.
Bananas (Fiji)	...
Lemons, per bushel-case	22s. to 25s.
Pineapples (Queens), per double-case	10s. to 18s.
Pineapples (Ripleys), per double-case	12s. to 16s.
Pineapples (Common), per case	7s. 6d. to 10s.
Oranges (Navel), per case	30s. to 32s.
Oranges (Other), per case	20s. to 21s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	6s. to 18s.
Apples, Cooking, per bushel-case	4s. to 14s.
Apricots, per quarter-case	12s. 6d. to 15s.
Bananas (Cavendish), per dozen	3d. to 1s. 1d.
Bananas (Sugar), per dozen	5d. to 9d.
Cocoanuts, per sack	15s. to 25s.
Grapes, per lb.	3d. to 5½d.
Lemons (Lisbon), per half bushel-case	15s. to 25s.
Lemons (Rough), per cwt.	...
Limes, per half bushel-case	...
Mangoes, per case	4s. to 11s.
Nectarines, per quarter-case	8s. to 17s. 6d.
Oranges, per case	6s. to 15s.
Papaw Apples, per case	4s. to 16s.
Passion Fruit, per quarter-case	5s. to 9s.
Peaches, per quarter-case	5s. to 10s.
Plums, per quarter-case	9s. to 13s. 6d.
Pineapples (Smooth), per dozen	7s. to 10s.
Pineapples (Rough), per dozen	5s. to 8s. 6d.
Pineapples (Ripley), per case	...
Rock melons, per dozen	...
Strawberries, per dozen pint-boxes	...
Tomatoes (prime), per quarter-case	11s. to 15s.
Tomatoes (inferior), per quarter-case	4s. to 9s.
Water melons, per dozen	6s. to 25s.

TOP PRICES, ENOGGERA YARDS, DECEMBER, 1919.

Animal.	DECEMBER. Prices.
Bullocks	£24 5s. to £27 10s.
Bullocks (single)	£34 10s.
Cows	£15 2s. 6d. to £17 15s.
Merino Wethers	66s.
Crossbred Wethers	67s.
Merino Ewes	38s. 6d.
Crossbred Ewes	60s. 6d.
Lambs	43s. 9d.
Pigs (Backfatters)	£9 10s.
Pigs (Porkers)	87s.

Orchard Notes for March.

THE SOUTHERN COAST DISTRICTS.

The marketing of the main crop of pineapples will continue to occupy the attention of growers; and as it is probable that the plantations have been allowed to get somewhat dirty during the previous month, they should be cleaned up as soon as ever the crop has been got off. The fruit of the new crop of citrus fruit will be showing signs of ripening towards the end of the month; and as the fruit during this period of its growth is very liable to the attack of insect pests of various kinds, it is important that steps should be taken to prevent loss arising from this cause as far as possible.

Large sucking moths of several kinds attack the fruit as soon as it shows signs of ripening; and as they always select the first fruit that shows signs of colouring, it is a good plan to gather a few forward fruit and to ripen them up quickly by placing them on a barn floor, and covering them up with bags or straw. They will turn colour in a few days, and develop the characteristic scent of the ripening fruit. The fruit so treated should be hung up in conspicuous places in the orchard as trap-fruit, as not only will it attract the moths, but also the fruit-flies. The moths will be found clustered round the trap-fruits in large numbers, and can then be easily caught and destroyed. Fruit-fly will also puncture such fruit; and if the fruit is destroyed before the larvæ reach maturity, a later crop of these insects is prevented from hatching out. Fruit-flies may also be caught in large numbers by means of such artificially ripened fruits. The fruits are smeared with tanglefoot, and hung about the orchard. The fly, attracted by the colour, settles on the fruit, and is caught in a similar manner to house-flies on specially prepared sticky paper. These simple remedies, if carefully carried out, will result in the destruction of large numbers of sucking moths and fruit-flies.

The yellow peach-moth that does such damage to peaches in spring, and that attacks corn, sorghum, cotton bolls, custard apples, and many other plants and fruits, often does a lot of damage to citrus fruits. It acts in a very similar manner to the second and later generations of the Codling moth of pomaceous fruits, in that it lays its eggs where two fruits touch, under the shelter of a leaf on the fruit, at the stem end of the fruit, and, in the case of navel oranges, in the navel itself; in fact, anywhere that there is a likelihood of the egg not being disturbed. The egg hatches out into a small spotted caterpillar, which eats its way into the fruit, causing it to ripen prematurely, and fall off. Where two fruits touch, it often eats into and destroys both, and it frequently leaves one fruit to go and destroy a second. It is a very difficult insect to deal with, owing to the number of fruits and plants on which it lives; but, as far as citrus fruits are concerned, the best remedy is undoubtedly to spray the fruit with a remedy that will destroy the young insect when it starts to eat the skin of the fruit. Bordeaux mixture has been found efficacious, but I am of opinion that spraying with Paris green and lime, Kedzie's mixture, or arsenite of lead, will also have good results. The latter poison is, in my opinion, well worth giving a thorough test, as it sticks to the fruit and leaves for a long time. Bordeaux mixture, either alone or in conjunction with Paris green or Kedzie's mixture, is, however, a good remedy, as not only will it destroy the larvæ or prevent the moth from attacking the tree, but it is also the best remedy for black brand or melanose, as well as tending to keep all other fungus pests in check. Fight fruit-fly systematically—both by means of the sticky fruit already recommended and by gathering all fly-infested fruit, such as guavas, late mangoes, kumquats, &c., as well as any oranges or mandarins that may have been infested, as if kept in check now there will be little loss throughout the season. A little fruit will be marketed towards the end of the month. See that it is gathered and sweated for seven days before marketing, and don't gather it too immature. Beauty of Glen Retreat mandarins are often gathered and marketed as soon as they show signs of colouring. They are then as sour as a lemon, and anyone who is unlucky enough to buy them will steer off mandarins for some time to come. This variety should not be gathered till thoroughly ripe, as when marketed in an immature state it spoils the market, as it puts people off eating citrus fruit.

Clean up the orchard after the summer rains, and have everything ready for the marketing of the crop. See that there is a good supply of clean, dry case timber on hand, as one of the greatest sources of loss in shipment is packing fruit in green cases.

Strawberry planting can be done throughout the month. Plant such berries as Federation on the lowest ground, and Aurie, Anetta, Trollop's Victoria, and Glenfield Beauty on warm, well-drained soils. Prepare the land thoroughly, so that it is in perfect tilth, and in a fit state to retain moisture well; as on this, as much as anything, the success of the crop depends. Where new orchards are to be planted, get the land ready—not the clearing, which should have been done months ago, but the working of the land, as it is advisable to get it thoroughly sweetened before putting the trees in.

THE TROPICAL COAST DISTRICTS.

The Notes for February apply equally to March. See that bananas are netted—keep down weed growth, and market any sound citrus fruits. Clean up the orchards as well as possible, and keep pines clean. Get land ready where new orchards are to be set out, as tree-planting can be done during April and May. Pines and bananas can still be planted, as they will become well established before winter.

THE SOUTHERN AND CENTRAL TABLELANDS.

Finish the gathering of the later varieties of deciduous fruits, as well as grapes. Clean up the orchard, and get ready for winter. Get new land ready for planting; and where there are old, dead, or useless trees to be removed, dig them out and leave the ground to sweeten, so that when a new tree is planted to replace them the ground will be in good order.

In the drier parts, where citrus trees are grown, keep the land well worked, and water where necessary.

Farm and Garden Notes for March.

FIELD.—Take every opportunity of turning up the ground in readiness for sowing and planting winter crops. The main crop of potatoes should at once be planted. As the growth of weeds will now be slackening off, lucerne may be sown on deeply cultivated soil. The latter should be rich and friable, with a porous subsoil. The land should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff clay subsoil. Prepare the land a couple of months before sowing, care being taken to cross plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed will be required; in the latter, 10 lb. A good stand of lucerne has been obtained with less quantities. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before they can again make headway enough to do any damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is now too late to sow maize, even 90-Day, with any certainty of harvesting a crop of grain. Rye grass, prairie grass, Rhodes grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and Swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, carob beans, sweet potatoes, opium poppy, &c. Sow anatto, jack fruit, and plant kola-nut cuttings. Some temperate-zone vegetables may be planted, such as egg plant, potatoes, &c.

Coffee-planting may be continued. Harvest kafir corn and paddy. Cotton-picking will now be in full swing. Pick cleanly, and expose to the sun for a few hours before storing or baling. Pick none but fully ripe bolls.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, Jacobean lilies, tigridia, tritonia.

All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf mould. Herbaceous plants and annuals which it is intended to raise from seed should be sown this month. Such are antirrhinums (snapdragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmea, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done.

Now, as to climbers which may now be planted. These are—*Allamanda Schotii* (beautiful yellow), *Antigonon leptopus,* a charming cerise-coloured climber; *Aristolochia elegans,* handsome as an orchid and easily grown; *Aristolochia ornithocephala* (Dutchman's Pipe), very curious, large, always attracts attention; *Asparagus plumosa* grows in any shady place; *Beaumontia grandiflora,* splendid white flower, grand for a fence, will grow 50 ft. high; Bignonias of several kinds; Bougainvilleas, with their splendid leafy pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; *Quisqualis indica,* a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the *Bauhinia scandens,* rarely seen about Brisbane. We grew a plant of this climber at Nundah, and it soon closed in the front of the veranda for a distance of over 80 ft. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossoms, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out where necessary in the autumn, which begins on the 20th of March. All unoccupied land should be roughly dug, and, when required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow French and broad beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, onions, mustard, &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, French beans, and tomatoes should be looked for every day and gathered, whether required or not, for, if left on the vines to perfect their seeds, the plants will soon cease to be productive, or will form inferior, ill-shaped, and hence unsaleable fruit.

A correspondent writes to be informed where he can obtain a few alligator pears for seed purposes. Would any grower of this fruit kindly advise the Editor of this Journal?

RATS AND COCOANUTS.

In his report for July last, Mr. Somerville, Instructor for Hanover, mentioned that rats were causing enormous losses to cocoanuts. The "Journal of the Jamaica Agricultural Society" is informed that one grower ties a piece of rope round his cocoanut trees and he has the rope tarred, and this apparently acts as a preventive to nut destruction. It would be good to try this on a large scale to see if there is any real advantage in it.

LAW SOMNER'S

FOR FODDER CROPS

Sheep's Burnet

A most valuable Fodder Plant. It will thrive on the poorest chalk soils, and is very suitable for dry countries where Lucerne or Clover will not succeed. Thrives well on rich or poor land—either on flats or hills. It is one of the best drought-resisting plants we know of, and when once established will repay any farmer. It is greatly liked by cattle if sown with other grasses and clovers, and is now in great demand. Price, 1/6 lb.; 140/- cwt., f.o.b. Melbourne.

Teff Grass

Introduced from South Africa some years ago, where it has proved of immense value for fodder. Cattle, Horses, Pigs, and Sheep devour it greedily. One farmer declares that cattle will leave green lucerne for it. Teff will thrive on any ground, wet or dry. Will grow luxuriantly where lucerne will not live. Teff has been cut for hay within seven weeks from the time it was sown. Prices, 1/6 lb.; 150/- cwt., f.o.b. Melbourne.

Seed Maize

ALL GOLD—This Maize has a stout stalk and plenty of flag. Has yielded fully 120 bushels to the acre. 12/6 bushel, f.o.b. Melbourne.

Turnips and Swedes

Are excellent feed for Cattle, Horses, Sheep, and Pigs. Ready in the late Autumn, and if pulled and stored can be kept for a long time during the winter months, when other feed is scarce. 5/- lb.; 4/6 lb. in 7-lb. lots or more; f.o.b. Melbourne.

Giant Half Sugar Mangel

Undoubtedly the most nutritious of all Mangels for feeding stock. It combines the large size of the Mangel with the greater feeding value of the Sugar Beet, which it outyields by two to one. Roots average about 12 inches in length, and 8 inches in diameter. 4/6 lb., f.o.b. Melbourne.

Sudan Grass

A tall annual grass, which under average conditions reaches a height of 5 feet. It is a great hay producing crop, both in quality and yield. Produces a larger tonnage of hay per acre than any other crop known. Sudan recovers rapidly after cutting, and the next crop is usually ready for harvest within thirty days from the first cutting. It is one of the most drought-resistant plants known, and at the same time it does not blight when moisture is heavy. Sow 5 lbs. per acre in drills, or 15 to 20 lbs. broadcast. 4/6 lb., f.o.b. Melbourne.

Special Fodder Circulars are issued each Season. They are invaluable to farmers. A copy will be sent post free on request.

LAW SOMNER PTY. LTD.

WHOLESALE AND RETAIL SEED
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QUEENSLAND
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Agriculture.

THE PRICE OF COTTON.

The Queensland cotton crop for 1919, handled by the Department of Agriculture, was sold in Sydney at 1s. 6d. per lb., a price which gave the growers a clear 5½d. per lb. for their seed cotton, or an average of £22 18s. 4d. per acre. The price of cotton in Liverpool was then 1s. 11d. per lb..

Advices received during January, 1920, from London, by a city firm in Brisbane, gave the present price of ginned cotton as 2s. 7½d. per lb., the highest price ever known in the history of the trade as regards Upland cotton. The cotton crop of the United States was very bad last year, and the demand since the armistice by continental peoples has been enormous.

The Indian crop is reported as suffering from extensive strikes, and Egyptian is in short supply, several difficulties having to be contended with. One is, that owing to the rise in the water since the building of the Assouan Dam, many cotton areas have become water-logged, whilst another is the increase of the pink boll-worm pest, which is very prevalent. Experimental lots of long-staple Egyptian cotton are selling at 5s. per lb.

Now, then, is the opportunity for Queensland to revive and extend the cotton-growing industry, even beyond what was done during the American Civil War, when there were exported from the State 26,000,000 lb. of ginned cotton worth £1,300,000. This represents 30,000,000 lb. of seed, which was thrown away as useless. Had there been one or more oil mills in the State, over £50,000, the price of the oil being £23 per ton, would have been added to the value of the crop, and the linters left on the seed, owing to the want of lintering machining, would have been worth £100,000.

The Department of Agriculture is doing all in its power to assist cotton-growers, by supplying seed gratis, by making an advance on the crop, by ginning and marketing the cotton, and by dividing all profit derived from its sale amongst the producers. The machinery is up to date, and the addition of a linter machine saved all the short fibre on the seed, which was formerly thrown away. We strongly advise farmers to grow a few acres, more or less, of Upland cotton next season, as prices, so far from falling, are, according to calculation in America, very likely to rise still higher.

FODDER SUPPLIES FOR THE COMING WINTER.

By G. B. BROOKS, Instructor in Agriculture.

At the date of writing (20th December) the outlook for the man on the land is far from promising, and for the owner of stock it is assuming a most serious aspect. No rain of a really useful nature has fallen over the eastern seaboard of Australia during the past nine months; and the total since April, 1918, is considerably under the average.

During the past two winters—in the Central district, at least—the raising of fodder or hay crops has been in most instances a total failure, the exceptions being on land that had been fallowed. We have no assurance that the coming winter is to be any more favourable than the past two; therefore it would be wise—now that all reserves in the way of hay, &c., have been used up—for farmers to have their land prepared, and the necessary seeds in readiness, so that advantage can be taken of the rains that may fall during the first three months of the year to plant quickly-maturing summer-growing crops suitable for winter feed. Those recommended are as follows:—

PANICUMS.

Heavy crops of various Panicums can be raised—either for hay or silage—on well-tilled land if sown during January and February. Both the White Panicum and the Common or "Liberty Millet" are heavy-yielding sorts; while the Japanese, although a somewhat lighter cropper, has the advantage of maturing earlier, and, therefore, can be sown somewhat later than the others. To broadcast an acre, 16 lb. to 18 lb. of seed are required.

SORGHUMS.

For an easily-grown, drought-resisting, heavy-yielding crop—and one that can be fed in a succulent state during the winter—Sorghum undoubtedly stands alone. To secure best results, it should be planted sufficiently late in the season—say, January—so that it will attain full growth, but not fully-matured grain, before the cold weather sets in, and in this condition it will stand over the winter in the field to be cut as required. The varieties most suitable are Planter's Friend (Imphee), Amber, Sassaline, and Sudan Grass. The latter, being a fine-stalked Sorghum, should be used before the advent of frost. Should any of the non-saccharine or grain varieties be grown, such as the "Milos" or "Feterita," it is suggested that the seed heads be removed, which will induce shooting at the joints, otherwise the crop would—if fully matured—dry out. Sow in rows 3 ft. apart, at the rate of 4 lb. to 5 lb. of seed per acre.

It may be mentioned that most of the grain or non-saccharine varieties are heavy seed-bearers, which, when fully mature, have a somewhat dry and pithy stalk. I have found, however, that, by stripping the seed head at the stage when the seed has commenced to form, the stalk becomes as sweet and in some sorts even sweeter than the saccharine variety, and when fed to pigs have been preferred to such.

An objection raised by some against the growing of Sorghums is the danger of poisoning. Losses from this cause are extremely rare—in fact, most of the losses that have occurred are through not having Sorghums to eat. The danger is invariably during the early stages of growth, or before the seed heads appear. Should there be any doubt, feed it to one of the least valuable animals on the place and note results.

MAIZE.

A maize crop that has failed to cob should not, as it generally the case, be allowed to go to waste. It is an excellent green fodder, but, as it dries up quickly in the field, it has, in order to retain its succulence, to be converted into silage. The fact that the stalks, when harvested while still green, dried, and stacked under cover, make a very good chaff for home consumption is not generally recognised.

A NEW MOTOR PLOUGH.

In these days of high prices for horses, for horse-feed, and harness, the farmer finds that the interest on his investment in these animals, and the price of feed consumed when his horses are idle, make serious inroads on his profits.

"Popular Science Siftings," London, in its issue of 4th November, 1919, describes the invention and perfection of a petrol motor plough which has opened up new possibilities for the small landowner who farms intensively.

The mechanism of the plough is exceedingly ingenious. The power is furnished by a two-cylinder, nine-horse power petrol engine. The initial expenditure for the plough with numerous attachments is about £80 in America. When it is in use it, of course, consumes petrol; but the expense ceases at the exact moment that work is stopped. Just at that time, when horses would be eating their heads off, the plough costs nothing whatsoever. The engine is geared to the traction wheel through a shaft with universal joints, and these wheels are pivoted like the wheels of a bicycle, so as to turn right and left to guide the plough. The traction wheels have spike-like projections to prevent their slipping; different sets of spikes vary in length to meet the requirements of the soil to be worked. The suction created by the plough holds the traction wheels to the ground; and, as the suction varies with the nature of the soil, the plough works equally well in sod, loose ground, loam, or sand.

The plough can be operated by any person able to operate a petrol engine. It can be guided, thrown in or out of gear, reversed, or made to go faster or slower while the operator keeps both hands on the handles. The advantage over a horse-propelled plough is evident when such an obstruction as a rock, stump, or root is encountered. Instead of the customary straining and jerking, with consequent danger of breakage, the traction wheels simply slip until the operator throws the engine out of gear. He may then reverse the engine to back out, and then guide the plough over or around the obstruction.

The plough has numerous attachments that enable it to furnish practically all the power needed in seeding, cultivating, and harvesting an ordinary crop. The shovel hoe and disc harrow put the ploughed ground in shape; a planter attachment performs the seeding; and the disc cultivator and shovel hoe make possible thorough cultivation. A mow cutter-bar and rake make it possible to harvest small crops of hay, clover, peas, and the like. There is a spraying attachment for spraying crops or trees in rows; the engine propels the machine and at the same time operates the pump. A cart attachment for hauling moves the implements from place to place and takes a six-hundredweight load to market. The engine even has a high-speed gear for road work.

When there is no need for ploughing, hauling, cultivating, or harvesting, the engine is still useful for stationary work. It has a belt pulley attached; and the owner may easily operate a pump, feed-cutter, cream separator, a 24-inch wood saw, or a dynamo for lighting the farm buildings. The engine may readily be detached from the plough frame and used on a motor-cycle, light automobile, or delivery wagon. A man mechanically inclined finds almost limitless possibilities for it.

The petrol motor-plough has also proved a boon to the professional man or gardener who wishes to cultivate a small plot. For this class the cost of horses and the labour of caring for them is absolutely prohibitive. The machine has a tread of only 12 inches; this makes it possible to plant the rows much closer than if horses were used. In addition, the motor plough makes a shorter turn at the end; it does not step on young, tender plants; and it always stands without hitching. It is an ideal plough for orchard work, as it runs under low-hanging limbs and close up beside the trees without the least injury.

CONTROLLING SILAGE FERMENTATION.

Experiments carried out at Utah, U.S.A. (says the "Pastoral Review"), go to show that all waste connected with the curing of ensilage can be eliminated by the proper control of the ferment. Anybody who has had to do with silos knows that there is always a certain amount of decay in evidence at the top, and often at the sides. This is caused by the absence of a certain bacteria, and it was decided to introduce this by artificial means. For the purpose of the test a 200-ton silo was built of concrete blocks, each block having an enclosed air space, which it was considered would maintain an even temperature. The building was filled with a fully-matured maize crop (not green), and the contents of a 2-oz. bottle of bacillus culture used to impregnate two or three barrels that were deposited in the silage at various heights. The bacteria introduced was the lactic acid bacillus, which is the same as that used by dairymen for ripening cream.

A bacteriological examination showed that active fermentation took place a week after the silo was filled, and subsequent weekly examinations gave favourable results. The contents were fit to feed to stock within a month; and, although feeding was continued slowly to give every chance for decay to develop, not the slightest sign of deterioration could be discoverd. It was also found that no alcohol formed, and that the sugar and starch contents of the food were intact throughout. The man who fed the silage to his stock declared the value to be 50 per cent. higher than stuff treated in the ordinary way. The ensilage is described as having turned out bright, clean, and very palatable. The grains were unbroken and sound, but the brittle hardness was gone, while the stalks were soft enough to crush between the fingers. The smell was like that of a mild pickle, and stock ate it eagerly.

MARKET GARDENING.

UTILISING THE BACK-YARD.

During the late calamitous drought, many householders have been hard put to it to obtain a supply of vegetables for the table. This difficulty can easily be overcome by any city dweller who owns or rents a house with a perch or two of garden or back-yard. The writer owns a very small piece of ground on which his house is built, with a few yards of garden ground in front, and the same at the back. Being fond of gardening, he utilised every square yard available, mainly for growing vegetables. The result was that during the drought there was no lack of most of the culinary vegetables. The restrictions on the water supply were overcome by using the bath water, kitchen slops, &c., and during that hard time vegetables were plentiful. If a soil happens to be gravelly or a stiff clay, this can be overcome by hard work such as trenching, subsoiling, manuring, and cultivation.

The following notes, taken from "South African Gardening and Country Life," go to show the possibilities of the "Back-yard Garden." With intense cultivation, the back-yard gardener should be able to get twice as much out of a square yard as the market grower gets. To do this, you must train everything upwards, and thus take advantage of the space above the soil. For instance, the farmer's tomato will require, at least, a square yard of soil because it is allowed to sprawl all over the ground. Yours will require a square foot because it will be trained up a pole. Then you will grow two crops on the same ground at the same time, for you can grow vegetable marrows amongst sweet corn. The latter is tall and the foliage not dense, and the marrow either runs on the ground or forms a dense bush, according to the variety you grow. Then you will sow radishes with lettuce, carrots, parsnips. The radishes will be ready to pull before the other plants need the room. Again, rows of spinach can be sown between rows of newly-planted cabbages, and lettuce plants set between the cabbages in the rows, both will mature before the cabbages require more room. If you grow potatoes, set sweet corn between every other row, and have some young cabbage plants ready to plant out between the rows left vacant as soon as the potato tops show signs of dying down. Line the paths with radishes or carrot rows, and replace early peas and beans with cauliflowers. The great thing is to have something ready to plant as soon as each crop is ready to be removed. Use every corner—the rubbish heap will grow pumpkins, cucumbers, and melons, and runner beans can be trained up strings to the top of the fence.

In conclusion, the South African writer gives the total produce from a piece of ground 10 yards by 12 yards, and shows how sufficient vegetables were grown on it to serve a family of four for a year.

What can be done in South Africa can easily be done in Queensland. There are scores of houses built on 16-perch allotments, and on larger building sites, where the back-yard is only used as a repository for old cases, kerosene tins, discarded furniture, bones, old iron, &c. The owners of these vacant spaces buy their vegetables, not always fresh, in the city or local store, at prices far higher than what they could be produced for at home in a garden worked in their spare time.

Pastoral.

STOCK FOODS ACT.

Under the Stock Foods Act which came into operation on the 1st of January, 1920, it now becomes necessary for every wholesale seller of any mixed concentrated or prepared stock food or by-product to supply, on or before the 31st of January in each year, to the Department of Agriculture and Stock, Brisbane, a sample of such stock food or by-product accompanied by full particulars as to analysis, &c. If the wholesale seller is not a resident in Queensland, an agent in this State may act for him. Full particulars as to how the sample is to be taken are given in the Act and regulations.

All retail sellers must affix to each package a label giving all necessary particulars concerning the stock food or by-product, as well as the weight and the seller's name.

Every seller, whether wholesale or retail, will be responsible for the composition as specified on the label of the article.

Every invoice or circular relating to a stock food shall state specificially the material of which such stock food consists, and the invoice or circular shall constitute a warranty by the seller that the food consists solely of the materials and proportions specified, that it is suitable for stock, and that the weights are correct.

When hay, consisting of several kinds of hay, hay chaff made from several kinds of hay, straw consisting of several kinds of straw, straw-chaff made from several kinds of straw, mixed chaff or compressed fodder, are sold, the invoice must specify in each case each component part of the food sold.

When mixed chaff composed of a mixture of hay chaff and straw chaff is sold, each package must be marked M.S.

Straw chaff must be marked S.C.

For the purpose of securing observance of the Act, authorised officers have the right of access to premises were stock foods are prepared or sold, and they may, on payment of the ordinary market price, take samples for analysis.

The buyer of stock food is entitled, upon payment of fee, to have samples of stock food analysed.

Officers are empowered to demand information as to the origin of any stock food which may be exposed for sale.

The penalty for a first breach of the Act is a fine not exceeding £20; for a second offence, a fine not exceeding £50; and for each subsequent offence, a fine not exceeding £100, or to imprisonment for a period not exceeding six months, or to both fine and imprisonment. Proceedings may be instituted by an officer authorised by the Minister or by any person aggrieved.

All such proceedings shall be taken in a summary manner before a police magistrate sitting alone. The burden of proof that any stock food was not intended for sale as a stock food shall, in every case, be on the defendant.

All firms dealing in low-grade stock foods must keep a register recording their transactions in these particular foods.

The fee for the analysis of a stock food to be paid by a wholesale seller is £2 2s. per sample. Farmers will be charged a nominal fee of 10s. 6d.

The Act applies to hay, hay chaff, straw, straw chaff, compressed fodder, whole grains, or seeds, meals made directly from wheat, rye, barley, oats, corn, sorghum, beans, peas, lucerne meal, corn and cob meal, calf foods, poultry foods, condimental stock foods, bran, pollard, linseed meal, cocoanut oil cake and meal, dried brewers' or distillers' grains, malt sprouts, blood meal, meat and fish meals, digester tankage, corn gluten meal, corn germ meal, molasses foods, dried skimmed milk, dried buttermilk, corn bran, and sweepings and mill flaws, grain sheds, ships' holds, stores, wheat groundings, and damaged grain.

The following are at present exempted from the operations of the Act:—Lucerne and other fodder crops cut and sold as green fodder; molasses, sugar-cane, wet brewers' grains, arrowroot bagasse, whey, skimmed milk and buttermilk.

Dodder, thorn apple, castor-oil seeds and physic nut are specified as foreign ingredients, and any proportion of these substances is strictly prohibited in any stock food, and the same prohibition applies to any substance of ordinary character added for the purpose of fraudulently increasing the weight of the stock food.

With regard to foreign ingredients, it is stipulated that there shall not be in a food more than 5 per cent. of certain by-products of low food value unless the actual amount is declared on the invoice and label. Moisture is limited to 13 per cent., and salt to ½ per cent. In the case where the stock food is a grain, the proportion of foreign grains must not exceed 5 per cent. by weight. In the case of hay straw and chaff, the bulk must consist of at least 90 per cent of the species of hay straw or chaff named in the invoice, unless the straw or chaff is invoiced stating the different ingredients. When mixed concentrated or prepared stock foods or by-products such as meals, calf foods, poultry foods, bran, pollard, molasses foods, &c., are sold, the vendor must affix to each package the number of net pounds in the package, the distinguishing name or trade-mark of the stock food, the address of both the wholesale and retail sellers, and the chemical analysis setting forth the percentage of protein, fat, and fibre, and the name of each of the original grains or materials and the proportion of any foreign ingredients.

Every vendor, whether wholesale or retail, must keep a copy of the regulations under the Act displayed in his shop, shed, or warehouse. Copies of the regulations, printed on cardboard, may be obtained on application to the Government Printer, Brisbane, for one shilling.

SHEEP WITH SORE FEET.

''Frequently at about this time of the year,'' recently wrote ''Agricola,'' in the ''Otago Witness,'' ''sheep contract sore feet, perhaps from some abrasion in which dirt or vegetable matter lodges, and it is just as well to get them off the muddy fields to a dry place. Something more than this is required, though. The foot should be cleaned and treated with some drying healing mixture. There may be disease of a sort, not quite foot-rot, but worth treating as such. The first thing to do is to use a knife and scrape away the dirt and trim the horn of the hoof into something like a foot. Do not draw blood, but cut away all the loose horn. Then make a mixture of pulverised sulphate of copper mixed with water to a creamy paste and apply with a wooden paddle, and turn out the patient to a fairly dry paddock, out, at least, of the muddy yards. It is well worth while keeping an eye on all sheep going at all lame and pull them out and trim feet of useless horn, which only serves to harbour dirt and possibly breeds sores and lameness. Any trouble with feet very often means a great set-back in condition of the animal if allowed to develop at will.''—Exchange.

DOES WIRE-NETTING BREED RABBITS?

In view of the fact that the farmers of the New South Wales coast recently decided to spend £15,000 on a barrier fence fifty-five miles in length, to keep the rabbit pest in check, Mr. Coleman Phillips, of Wellington (N.Z.) has written to the president of the Casino Pastures Protection Board, stating that barrier fences in every State in Australia have proved ineffective. Mr. Phillips states that in Europe, Asia, Africa, and America wire-netting fences are not used, and these countries are not troubled with rabbits. Australia does use netting fences, and it is the only continent where the rabbit flourishes. The other countries rely upon natural enemies and diseases. Mr. Phillips adds that wire-netting, as a means of combating the pest, is a waste of money, as he found on his own run in New Zealand in 1883, when he had ten miles of back country and Crown boundary to clear of rabbits, which were swarming everywhere at the time. The plan that he had proposed to his neighbours was not to depend upon netting, but to turn out the natural enemies of the rabbit, and to spread the natural diseases. This plan was adopted, and no grain-grower in the district has been troubled with rabbits since, or has had to protect his crops with netting.

''For thirty years,'' he concluded, ''we have been free of rabbits.''

A MULE WITH A FOAL.

Mr. Jas. S. Love, Townsville, writes to the "Pastoral Review":—"My manager at Butcher's Hill Station, 60 miles outside Cooktown, reports: 'A jenny mule had a foal here the other day. I have heard people say that they have heard of a mule with a foal. Can you give me an instance? The jenny mule is from a half-draught mare by a Catalonian Jack (Spanish), and her foal is by a blood horse.' "

Can any reader supply us with an instance in which a mule, to their knowledge, has had a foal?

FRENZIED SHORTHORN FINANCE.

Under the above heading "The Farm" (Perth, W.A.) publishes the following record prices obtained at the sale of Mr. Duthie's Collynie Shorthorns in October last, which obliterated all previous price records wholesale:—

"The first lot offered was a beautiful red bull calf, 'Collynie King Lavender,' and the first bid made for him was 1,000 gns., increased within a minute to 2,000 gns., and thence by leaps and bounds to 5,300 gns., at which price Scotland let a Kentish breeder have him. Mr. Duthie already held the price record for a bull calf, viz., 4,200 gns., so that he beat his own and all other records by over 1,000 guineas. A dark roan heifer calf, 'Myrtle,' brought the record price of 2,000 gns. Mr. Duthie's bull calves averaged £1,400 8s. 9d., thus beating the same breeder's record, established last year, of £1,088 per calf. At the Collynie and Uppermill Shorthorn sales, 595 Shorthorns realised £205,497 13s., an average of £345 7s. 5d. Mr. Duthie's 39 'beasties' averaged £1,000 per head."

THE MOTOR METHOD OF FUMIGATING RABBIT BURROWS.

Reference was made in the "Farmer and Settler" some time ago to a new method of fumigating rabbits in their burrows devised by Mr. Walter Hawker, a well-known South Australian pastoralist. The method has been tried with success also in New South Wales.

Mr. Hawker's method was to use the exhaust from his motor-car to poison the rabbits. One end of a rubber hose was attached to the exhaust, and the other end was placed in the rabbit burrows. The engine was run with the throttle one-fifth open, and soon smoke issued from the burrows, which were filled in until no more smoke appeared. The engine was run for five minutes, then the hose was withdrawn, and the hole filled in. Five large burrows were fumigated; after a lapse of 30 minutes the first one was dug out, and one dead rabbit was found at the mouth of one of the holes. Next day, when all the fumigated burrows were dug out, over fifty dead rabbits were found, and only one live one, which was in a hole that had been missed.

Mr. Hawker spent six hours fumigating seventeen burrows that would have taken a team of seven men eight days to destroy by the old method at a cost of £32 2s. Working the car for six hours, two gallons of petrol and about one pint of oil were used, the total expense being about £1. Later the rabbit boss suggested using a small two-cycle engine, mounted on a spring cart. The silencer was taken off, and 30 ft. of 1 in. rubber hose used, so that all the fumes went down the burrows. The result was that all rabbits were killed a few minutes after the last burrows had been stopped.

Paddock No. 1, of 1,900 acres, took nearly three months to dig out, at a cost of about £300. Paddock No. 2, of 1,100 acres, under the new method, took under three weeks with three men and a cook, and less out-lying rabbits were left. The man working the engine acted as rabbit boss.

Commenting upon these experiments, the president of the New South Wales Graziers' Association (Mr. John Mackay) said that a member of the association had tried the new method in the Warialda district with equally favourable results. Many of the graziers (he added) were of the opinion that this simple means of destruction would revolutionise the methods of dealing with the rabbit.

Mr. T. G. Adamson, of Nemingha (N.S.W.), has forwarded to the New South Wales Minister for Lands (Mr. Ashford) a scheme for the wholesale destruction of rabbits by poison-gas in the burrows. The proposal is that gas be introduced into the burrow by a bulb or shell, which could be rolled in with a time fuse attached, or perhaps liquid fire could be used instead of gas. Special masks must be used by the operators, and the bulbs made fool-proof. Mr. Adamson says that his scheme is far more effective, handier, and more economical than the use of the poison-cart, or fumigator, or than shooting or trapping.—"Farmer," W.A.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1920.

Considering the conditions of the month, the laying generally has been satisfactory. During the first ten days the laying showed a very marked increase, but as soon as the rain came a large number of pens, especially in the light groups, slackened. The heavy groups have shown an improvement on the December laying. There are only a few odd cases of moulting, and broodiness has not been quite so troublesome during the month. The health of the birds has been good, except that in the light breeds the feeding has not been all that could be desired. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS.			
*T. Fanning	White Leghorns	138	1,365
*J. M. Manson	Do.	125	1,359
*E. A. Smith	Do.	135	1,290
*W. Hindes	Do.	133	1,278
*Dr. E. C. Jennings	Do.	121	1,230
*Dixie Egg Plant	Do.	97	1,197
*G. W. Hindes	Do.	118	1,188
*Range Poultry Farm	Do.	117	1,172
*Quinn's Post Poultry Farm	Do.	113	1,166
*W. Becker	Do.	133	1,166
*Haden Poultry Farm	Do.	108	1,163
*B. Caswell	Do.	115	1,161
*C. P. Buchanan	Do.	119	1,134
J. H. Jones (Toowoomba)	Do.	101	1,127
*H. Fraser	Do.	116	1,120
S. McPherson	Do.	114	1,109
*L. G. Innes	Do.	79	1,106
W. A. Wilson	Do.	115	1,083
*W. Lyell	Do.	124	1,081
*Mrs. L. F. Anderson	Do.	107	1,076
*J. J. Davies	Do.	88	1,073
*Mrs. A. G. Kurth	Do.	102	1,065
A. Williams	Do.	88	1,044
*Thos. Taylor	Do.	108	1,043
G. J. Byrnes	Do.	98	1,037
S. W. Rooney	Do.	94	1,021
*Mrs. R. Hunter	Do.	93	995
Mrs. N. Charteris	Do.	117	988
Geo. Trapp	Do.	77	985
H. A. Jones (Orallo)	Do.	77	981
*O. W. J. Whitman	Do.	97	968
B. Chester	Do.	78	950
C. A. Goos	Do.	98	946
N. A. Singer	Do.	90	935
G. H. Kettle	Do.	85	933
Oakleigh Poultry Farm	Do.	99	914
J. W. Newton	Do.	75	913
H. O. Jones (Blackstone)	Do.	91	913
R. C. J. Turner	Do.	97	877
J. H. Dunbar	Anconas	102	825
W. Morrissey	White Leghorns	63	816

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
	HEAVY BREEDS.		
*R. Holmes	Black Orpingtons ...	125	1,378
*E. F. Dennis	Do.	132	1,338
*R. Burns	Do.	126	1,315
*E. M. Larsen	Do.	97	1,254
*W. Smith	Do.	108	1,210
*A. E. Walters	Do.	112	1,202
*E. Morris	Do.	101	1,135
Geo. Nutt	Do.	91	1,127
*Kelvin Poultry Farm	Plymouth Rocks ...	101	1,123
*Nobby Poultry Farm	Black Orpingtons ...	92	1,095
*T. Hindley	Do.	108	1,090
*A. Shanks	Do.	68	1,078
*Mars Poultry Farm	Do.	121	1,078
R. B. Sparrow	Do.	116	1,044
*Jas. Ferguson	Chinese Langshans ...	99	1,038
*D. Fulton...	Black Orpingtons ...	77	1,005
Burleigh Pens	Do.	105	975
*W. H. Reilly	Chinese Langshans ...	82	974
A. Homan	Black Orpingtons ...	97	971
*F. W. Leney	Do.	86	937
J. A. Cornwell	Do.	114	913
*H. Puff	Rhode Island Reds ...	63	892
C. H. Singer	Black Orpingtons ...	109	880
H. Ashworth	Do.	101	845
A. Gaydon	Do.	102	836
*T. B. Barker	Do.	59	834
Total	...	6,837	71,360

* Indicates that the pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
T. Fanning	226	212	224	241	225	237	1,365
J. M. Manson	234	212	240	235	207	231	1,359
E. A. Smith	213	208	231	213	201	224	1,290
W. Hindes	224	221	217	196	207	213	1,278
Dr. E. C. Jennings	209	184	209	198	197	233	1,230
Dixie Egg Plant	188	204	209	202	187	207	1,197
G. W. Hindes	216	204	215	192	180	181	1,188
Range Poultry Farm	189	202	214	205	173	189	1,172
Quinn's Post Poultry Farm ..	188	190	198	228	180	182	1,166
W. Becker	226	204	215	185	153	183	1,166
Haden Poultry Farm	218	210	197	189	154	195	1,163
B. Caswell	163	141	191	225	251	190	1,161
C. P. Buchanan	168	217	166	187	186	210	1,134
H. Fraser	156	212	216	192	140	204	1,120
L. G. Innes	149	213	151	203	211	179	1,106
W. Lyell	169	194	202	171	176	169	1,081
Mrs. L. F. Anderson	198	209	170	186	148	165	1,076
J. J. Davies	177	183	188	175	170	180	1,073
Mrs. A. G. Kurth	219	189	189	175	138	155	1,065
Thos. Taylor	179	141	161	199	204	159	1,043
Mrs. R. Hunter	162	121	186	171	178	177	995
O. W J. Whitman	153	191	145	147	172	160	968

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Holmes	234	233	252	207	274	178	1,378
E. F. Dennis	229	208	238	218	195	250	1,338
R. Burns	230	198	210	281	212	184	1,315
E. M. Larsen	220	215	240	190	217	172	1,254
W. Smith	184	215	207	177	221	206	1,210
A. E. Walters	216	175	213	198	197	203	1,202
E. Morris	185	184	204	193	223	146	1,135
Kelvin Poultry Farm	251	168	185	135	199	185	1,123
Nobby Poultry Farm	175	158	163	178	207	214	1,095
T. Hindley	182	195	158	205	164	186	1,090
A. Shanks	86	154	226	176	206	230	1,078
Mars Poultry Farm	163	216	214	148	141	196	1,078
Jas. Ferguson	178	232	141	146	172	169	1,038
D. Fulton	148	171	169	157	178	182	1,005
W. H. Reilly	147	140	193	182	146	166	974
F. W. Leney	113	147	169	207	145	156	937
H. Puff	176	142	149	182	96	147	892
T. B. Barber	141	151	118	136	147	141	834

CUTHBERT POTTS,
Principal.

OLD ENGLISH GAME.

By R. T. G. CAREY, Beerwah.

Handsome, graceful, and beautiful are Old English Game, told in three words, more especially their carriage and style, and the pride and prowess of the male birds cannot be excelled, as their magnificent plumage calls for admiration as premier birds from a fancier's standpoint.

Their laying qualifications have nothing of importance to commend their usefulness as egg-producers, since they only lay a limited number of eggs in the year. But, for early broodiness, one is never disappointed, because the hens will sit very early, almost at midwinter, and have a clutch of chickens out and well advanced before breeders contemplate operating incubators. The hens' propensity to forage and feed their brood is superior to that of any of the other females of the fowl family. As defenders against reptiles or hawks, butcher birds, or any other enemy, they cannot be excelled.

Yet, notwithstanding all their usefulness in that respect, they are underrated, and a thousand pities, too, for if others knew how valuable an asset that early hatching may be, many a fowl-raiser would certainly possess a pen or two of Old English Game.

Apart from the above qualifications, the use of them for crossing purposes greatly improves the flesh value of the progeny crossed. I, myself, cross them with the Black Orpingtons, which I find is a better fowl for hatching, laying a larger egg. She is a more useful mother, better forager, and a powerful defender; yet gentler and more careful with the brood under her charge than I ever found with the clumsy, barbarous, and careless Orpington mother, whose bulk and awkwardness is accountable for damage or broken eggs whilst sitting, as well as the treading and injuries caused to many of the chicks in the clutch. The Old English Game, Orpington cross, produces a progeny with close feathers, dense flesh, smaller bone-frame, but broader and deeper breast meat. In flavour, it is far superior to the flesh of the Orpington bird.

Old English Game are very active and agile, ever on the alert to spring, which comes from their pugilistic instinct, and their fighting qualifications bred into them of yore, for game-pit sport; and which is still being transmitted. Therefore, if the gallant game's opponent was at all lacking in alertness, the former would rapidly win the battle. Hence, that quick side jump and high leap into the air so often witnessed, when a leaf or twig happens to move unawares or suddenly.

It would never be profitable to allow these sportive male birds to mate with, or be at large, where other males are kept, notwithstanding their breed or friendliness, for as sure as figs grow, or pigs grunt, these Old English Game roosters will fight with every cock in the paddock. Eventually, in all probability, a Verdun battlefield might be seen strewn with dead birds, because they fight to the death. Those losses would be greater than all his beautiful plumage, stately carriage, and gamefulness would recoup. The hens are not such destroyers, and can mingle and agree admirably in company with any other family of breeds, and, even when rearing a brood, can mix safely without any harm.

At shows or exhibitions, Old English Game are the gala birds, as compared with the ordinary show game cocks. The breed is remarkable for very short legs; they are not shorter, as compared with some other breeds. The beak, which is rather curved and strong, especially at the base, is the important weapon in the game cock's armoury. The neck is long, far-reaching, and strong, to enable him to utilise his main weapon, the beak. The chest is broad, the body, tapering somewhat like a pear towards tail, is lengthy and powerful, the wings powerful, thighs muscular, short, and wide apart, the shank not flat on the shin, the four toes are long and well spread, the hind ones set well back and flat on the ground. Spurs—sharp, powerful, and set low. The plumage—glossy and fine, hard in handling. Head of medium length; eyes, piercing, quick; neck hackle, long and wiry; back, short, tail, strong; main feathers, broad and curved, and sickles plentiful. The black-breasted have brassy wings, red or ginger-red hackle. The above fowls are rare, though very hardy, and easily reared, and it seems a pity that such elegant birds are not more fully appreciated.

The mating is a problem that requires much study in order to obtain the beauty of feathering, although the virile forces, by the law of transmission, are inherited and transmitted. The 280 egg-laying hen was not reared last year, but by several generations of most careful selection, judicious feeding, and management, for several matings, which laid the foundation broad and deep for the stimulating of the oocytes (ovary) developments that we have in the queens of the egg-layers. But the egg-producing development of Old English Game is still distant, although you have the superb physical and muscular developments which characterise these birds of the highest order, and that is the basic principle for constitutional strength and vim; requirements fulfil all that is lacking in other breeds, and so helpful in the work of crossing.

The foregoing *apercu* is not a bait for folks to rush and purchase Old English Game, to start the prize-pit anew. That is far from my idea. It was purely to write something out of the common; and Old English Game are birds rarely spoken of or written about in this era. The reader may appreciate the breed from a cross fancier's or show point of view, but not the cockpit.

THE MUSCOVY DUCK.

By R. T. G. Carey (Muscovy Breeder), Beerwah.

Another year has rolled by. How did you fare with your Muscovies? Were you satisfied with the Yuletide values—14s. per pair—or dissatisfied? The enhanced prices were very profitable for the raiser, notwithstanding the high-priced foods. But are you preparing now for the Easter festivals, when the fatted Muscovy duck will realise the values given for the Christmas birds?

All the ducklings now not fully developed must be allowed free range, as the young, tender springing grass caused by the recent rains will help much to lower the food bill, as the youngsters roam hither and thither in search of the juicy insects, thus improving their condition, and considering that there are a few weeks that can be spared before penning up for fattening, consequently a wide scope or range feeding can very well be adopted.

As most of the breeders are now sitting upon the second season's hatch, which will be due about February, our country breeders must be on the lookout for iguanas—very bad enemies, especially for eggs. Therefore these reptiles must be destroyed on sight. See that the broody ducks have comfortable nests, and are well shaded, as well as protected from storms or rain. All future breeders should by this time have been selected and ought now to be penned, they will begin to lay about now, and many of them ought to be showing the scarlet face which indicates maturity. It is advisable that they produce a batch of eggs and brood before the winter sets in, as the youngsters will be well advanced, by that time. Cull them severely, and keep only the choicest over for operations during next spring.

Dispose of all three-year-old breeding ducks, after this breeding season is over, on the Easter markets. "Daddy" drakes, whose usefulness for stud work has become enervated, must also fill the sales crates.

After this, your whole care can be focussed upon the new stock, getting them primed and conditioned for the early hatches of next year's Yule markets, which proved so remunerative last Christmas. The above notes may be a little premature; nevertheless, begin early, hatch early, cull early, and mate up early. Then your duckling may have the chance of a few months of range-feeding, which helps to develop good-sized frames, and produces the prime Christmas and Easter duck.

POULTRY FOR EGG PRODUCTION.

How often have we ("Journal of the Jamaica Agricultural Society") received letters stating that the hens were not laying as the cock was too old, or not of good strain, and asking for reference to secure a cock of good laying strain "to make the hens lay," and although we have often written in the journal that pullets will lay just as well without a cock, the belief still commonly prevails amongst non-readers. Here is a paragraph on the subject from "Farm, Field, and Fireside" (England):—

THE MALE IS SUPERFLUOUS

when breeding operations are not contemplated. It has been proved over and over again that hens will lay just as many eggs without a male consort as with one. The male exercises no influence whatever over the number of eggs laid by hens he may be mated with, but the notion that he does dies hard in many people's minds. It is folly to keep a cock bird where eggs are produced only for consumption, especially where space is limited, and his crowing may be a perpetual nuisance to neighbours. Moreover, he not only occupies the room of another hen, but also eats food in waste. Again, unfertilised eggs keep better, and are preferable for putting down.

TWO METHODS OF PREPARING RABBIT SKINS.

For the information of those who have often asked us for a recipe for curing or tanning rabbit skins, we take two good methods from the "Journal of the Jamaica Agricultural Society."

First Method.—The fur of the common rabbit can be used very successfully at home for several purposes; lining small children's garments, mittens, foot warmers, insoles, &c. Here is a recipe to cure the furs at home:

Tack the furs, when still fresh, on a plank, hair side to the wood. With a knife carefully scrape away all little pieces of skin. Dissolve one teaspoonful of alum and one-half teaspoon salt in one cup of water, and rub this on the skin. Let this stay on one day, then scrape again, and when necessary put on for the third time. When they look clean take them off the plank and with a hammer beat on the hair side till the fur is soft. A little unsalted butter rubbed on the skin side will help this last process.

Second Method.—A popular and satisfactory method of curing rabbit and other small skins is to take saltpetre, one part; alum, two parts; and salt, two parts. Roll as finely as possible with a glass bottle, and mix thoroughly together. Take the skins when quite fresh, or soak well before treatment if dry to begin with, and go over carefully, removing all adhering pieces of flesh or fat. Now coat with the mixture, roll up neatly, and keep in a dry, airy apartment where frost cannot penetrate. Allow of rabbit skins resting ten days, mole skins a week. Now rinse thoroughly to remove all traces of dressing, dry slowly, and manipulate well daily with the fingers to assure suppleness. Another plan is to stretch the skins taut, remove superfluities with white soap, fine pumice-stone and warm water, and dress—applying hot, but not allowing to boil—with a mixture of 2 oz. hard, white soap, 1 oz. salicylic acid, and ½ oz. borax. Apply thoroughly with a paint brush, and again twice at forty-eight hours' interval, dry for a week, and then supple as before.

Dairying.

PROPOSED BUTTER FACTORY AT INNISFAIL.

A meeting of shareholders of the proposed butter factory at Innisfail was held on the 20th December, 1919, when the report of the provisional directors was read by the secretary, Mr. S. K. Page. This report detailed the workings of the scheme as from September, 1918, up to date, and showed that the number of persons who had signed for shares proved that they greatly favoured the establishment of the dairying industry in the district. The site recommended in the report where the factory would be erected was unanimously approved of in every respect, being central and access to the factory very good. As the report showed that the business of initiation of the scheme had been well gone into, nothing now remained but to go right ahead with the erection of the factory. The statement of receipts and expenditure tabled showed a credit balance, and the report as read was received and adopted. The total number of shareholders who had signed up for shares from 10 to 500 was 83.

After some discussion, Mr. F. L. Sugden moved, and Mr. J. Giddens seconded—That a company be registered and called "The Johnstone River Co-operative Butter and Bacon Factory," with 12,000 shares at £1 each. This was carried unanimously.

The following gentlemen were elected as directors:—Messrs. W. D. Davies, G. Hing, C. C. Collins, J. C. McGrievy, S. Archbold, F. L. Sugden, and S. K. Page.

An informal discussion took place on the necessity for planting grasses suitable to the district, and for observing the proper times and methods of planting different seeds. A vote of thanks to the provisional directors was carried by acclamation.

The full report of the provisional directors included a statement that it was considered that it would cost about £4,000 to build such a factory as would be a credit to the district, and which would give the dairying industry the impetus that it needed. Taking into consideration the number of good grasses that can be grown in the district, and the richness of the soils for cultivation, there was little room for doubt as to the dairying industry being a pronounced success.

ANOTHER CANE-CUTTING INVENTION.

The Hawaiian correspondent of the "Louisiana Planter" writes:—Invention of a mechanical cane cutter which may revolutionise field operations in connection with the harvesting of crops is claimed by V. L. Stevenson, of Hilo, in an article which appeared recently in the "Hilo Post-Herald." He is applying for a patent for his invention, which is said to be simple, although it took twenty years to perfect. The germ of the idea was obtained in Queensland, and Mr. Stevenson added to his information from the fields of Fiji and later from those of Hawaii. He claims other inventions have gone on the wrong track, and to have been an observer of all such inventions as have been announced. Mr. Stevenson is quoted on the subject, as follows:—

"Everybody who knows anything about sugar plantation work realises that the cost of cutting cane by hand labour is a very large item in the annual expenditure budget. I have invented a machine whereby 90 per cent. of cane cutting labourers will be eliminated. There is no need to say anything more about the proposition. Everybody knows that labour is becoming harder and harder to get, and that mechanical means that will eliminate 90 per cent. of the cane cutters means that millions of dollars will be saved the plantations and homesteaders. That the cane cutter I have invented will be used throughout the entire cane sugar world is a certainty.

"There have been many attempts in the past to produce a machine that would cut cane, but they have all resulted in failure," the article continues. "The inventors were all men who were engineers without practical experience in the canefields. They overlooked the very important fact that many varieties of cane twist and turn as they grow, and, finally, lie on the ground. The machines invented in the past failed to accomplish anything with the fallen cane, and simply left stumps standing everywhere. Then irrigation ditches and water furrows handicapped the machines to a tremendous extent. There was not one machine that looked promising when it came to a real trial of cane cutting."

Tropical Industries.

CANE CRUSHED IN THE NORTHERN SUGAR MILLS FOR THE SEASON 1918-1919.

The "Courier" correspondent at Cairns (14th January) gave the following particulars of the quantities of cane crushed during the least season in the Northern sugar mills, the figures for 1918 being given in parentheses:—Mourilyan 63,000 (28,000); Goondi, 68,000 (40,000); South Johnstone, 87,000 (47,000); Mulgrave, 79,000 (56,000); Hambledon, 97,000 (68,000); Mossman, 53,000 (49,000); Babinda, 140,000 (93,000). Totals, 587,000 (381,000). Babinda is the only mill that is still crushing and the above figures are approximate, being based on the crushing at Babinda to date. Magnificent rains have fallen in the whole of the coastal sugar belt during the past week, aggregating up to 8 in., and growers are busily engaged in ploughing, chipping, and planting for the new season, for which the prospects are very bright.

THE CULTIVATION OF SUGAR-CANE IN QUEENSLAND.

By HARRY T. EASTERBY, General Superintendent of the Bureau of Sugar Experiment Stations.

PART VII.

VARIETIES OF CANE.

The subject of cane varieties has been extensively dealt with in Bulletin No. 2 of the above Bureau, copies of which may be had upon application. A few notes, however, upon the subject may prove useful.

The introduction and testing of new varieties is constantly going on at the Sugar Experiment Stations, and growers can obtain such of these as have been thoroughly tested as sugar producers and croppers, and which are free from disease, during the year, by sending in their names and addresses to the Northern, Central, and Southern Sugar Experiment Stations at South Johnstone, Mackay, and Bundaberg, according to the localities in which they live.

The price for sugar-cane paid by the different sugar-mills is fixed by a Local Board or by the Central Cane Prices Board under the Regulation of Sugar Cane Prices Act and is based upon what is known as the commercial cane sugar in the cane, this being determined by analysis at the mill. All cane containing over 7 per cent. of commercial cane sugar cannot be refused. In fixing a price deductions may be allowed in respect of—

(*a*) Burnt, frosted, or diseased sugar-cane; or
(*b*) Badly-topped or trashy sugar-cane;
(*c*) Varieties of sugar-cane, the growing of which is disapproved by the Local Board or by the Central Board.

It will therefore be seen that it is highly important to grow only the best and richest varieties of sugar-cane, and it is on this point that the Sugar Experiment Stations can be of the greatest value to farmers in supplying them with good varieties of cane and keeping them advised as to the analyses of same during different periods of the crushing season.

The following table, containing the analyses of different varieties grown in Queensland, will be of interest to growers as a guide. Those marked with a star are not generally recommended:—

ANALYTICAL DATA OF CANE VARIETIES GROWN COMMERCIALLY IN QUEENSLAND AT THE PRESENT TIME, FOLLOWED BY RECOMMENDATIONS AS TO THE BEST KINDS TO GROW IN THE DIFFERENT SUGAR DISTRICTS.

Variety.	Crop.	Age, Months.	Brix.	Sucrose.	Purity.	Fibre.	C.C.S.	Arrowing.
Rappoe, or Rose Bamboo	Plant	19	20·1	17·9	89·0	10·30	14·13	Arrows
	Ratoon	12	18·5	17·2	92·9	11·58	14·74	,,
Mauritius Gingham or Striped Singapore	Plant	16	19·1	17·63	92·3	10·82	14·14	,,
	Ratoon	12	22·8	19·93	87·4	11·78	15·29	,,
*White Bamboo	Plant	13	19·5	17·90	91·8	12·86	13·98	,,
	Ratoon	12	18·8	17·11	91·0	13·08	13·26	,,
*Malabar ..	Plant	19	19·2	17·19	89·5	12·80	13·24	,,
	Ratoon	12	20·9	18·63	89·13	13·72	14·16	,,
*Daniel Dupont	Plant	15	18·1	15·89	87·79	11·8	12·22	,,
	Ratoon	12	18·15	15·62	86·11	12·62	11·76	,,
*Otamite ..	Plant	20	19·70	17·82	90·45	8·84	14·44	..
	Ratoon	15	18·80	16·13	85·79	9·47	12·55	..
*Cheribon ..	Plant	21	21·70	20·15	92·85	11·02	16·18	..
	Ratoon	12	17·50	14·30	81·71	11·00	10·58	..
Meera ..	Plant	13	17·9	16·17	93·5	10·21	12·89	Arrows
	Ratoon	12	18·2	17·04	93·6	11·80	13·63	,,
N.G. 15 or Badila	Plant	11	20·9	19·32	92·44	9·31	15·87	Sparse and late
	,,	12	21·2	20·27	95·61	8·42	17·04	,,
N.G. 15 or Badila	Plant	13	23·0	21·96	95·47	9·62	18·20	,,
	,,	14	23·9	22·93	95·94	9·13	20·81	,,
	,,	15	23·9	22·43	93·84	7·30	18·88	,,
	,,	16	22·2	20·58	92·70	7·30	17·21	,,
	,,	18	21·0	19·74	94·0	7·30	16·63	,,
	,,	19	21·8	20·45	93·8	8·00	17·09	,,
	,,	20	23·4	21·99	93·97	9·62	18·06	,,
	,,	21	23·1	21·93	94·93	9·62	18·12	,,
	Ratoon	10	22·5	21·54	95·70	10·70	17·67	,,
N.G. 16 ..	Plant	12	19·9	18·69	93·72	11·00	15·11	Arrows
	Ratoon	11	22·3	19·82	88·80	10·60	15·58	,,
N.G. 22 or Mahona	Plant	13	20·7	19·40	93·70	8·88	16·04	..
	Ratoon	12	21·2	19·91	93·90	11·17	16·07	..
N.G. 24 or Goru	Plant	17	21·4	20·22	94·40	11·04	16·40	Arrows
	Ratoon	11	21·6	20·27	93·80	11·61	16·27	,,
N.G. 24A ..	Plant	17	20·0	18·47	92·3	11·23	14·75	Sparse
	Ratoon	11	21·0	19·74	94·0	11·92	15·81	,,
N.G. 24B ..	Plant	17	19·6	18·11	92·3	11·84	14·37	,,
	Ratoon	10	20·5	19·44	94·8	11·75	15·70	,,
N.G. 40 ..	Plant	23	18·4	16·64	90·4	11·13	13·07	..
	Ratoon	12	18·3	17·22	94·09	9·92	14·11	..
*N.G. 47 ..	Plant	13	20·5	18·00	87·9	11·25	13·94	Arrows
	Ratoon	12	22·1	20·83	91·5	13·56	16·39	,,
*N.G. 48 ..	Plant	13	20·3	18·35	90·4	10·70	14·56	,,
	Ratoon	12	21·6	19·86	91·9	13·37	15·36	,,
B. 147 ..	Plant	13	23·5	21·39	91·0	12·0	17·29	..
	Ratoon	12	21·4	20·01	93·5	13·08	15·86	..
D. 1135 ..	Plant	16	19·47	18·06	92·7	11·00	14·50	Arrows
	Ratoon	11	18·60	16·93	91·02	11·00	13·44	,,
Mauritius Malagache	Plant	13	20·08	18·22	90·83	10·72	14·48	,,
	Ratoon	11	20·84	19·80	95·0	9·94	15·86	,,
Mauritius 1900 Seedling	Plant	18	19·30	17·56	90·98	10·81	13·97	,,
	Ratoon	12	19·80	18·36	92·72	9·71	14·95	,,
Black Innis or M. 189	Plant	18	19·50	17·68	90·66	10·47	14·09	,,
	Ratoon	11	21·20	20·48	96·60	11·21	16·68	,,
*H.Q. 5 ..	Plant	13	19·10	16·92	88·5	11·69	13·11	,,
	Ratoon	12	19·2	17·56	91·4	12·63	13·88	,,

ANALYTICAL DATA OF CANE VARIETIES GROWN, ETC.—*continued.*

Variety.	Crop.	Age, Months.	Brix.	Sucrose.	Purity.	Fibre.	C.C.S.	Arrowing.
H.Q. 10 ..	Plant	13	20·6	19·07	92·5	11·20	15·26	Arrows
	Ratoon	12	20·5	19·15	93·4	11·17	15·41	,,
H.Q. 114 ..	Plant	13	20·1	18·11	90·0	11·37	14·23	,,
	Ratoon	12	19·3	17·93	92·9	12·61	14·15	,,
H.Q. 222 ..	Plant	13	19·6	17·13	87·4	10·87	13·27	,,
	Ratoon	12	18·1	16·60	91·7	9·36	13·46	,,
H.Q. 285 ..	Plant	13	18·0	16·01	88·9	9·55	12·74	,,
	Ratoon	12	19·7	18·56	94·2	10·61	15·08	,,
H.Q. 297 ..	Plant	13	19·4	17·30	89·1	10·59	13·63	..
	Ratoon	12	19·5	17·60	90·2	11·05	13·88	..
H. Q. 426 ..	Plant	11	20·55	20·05	97·5	10·36	16·69	..
	,,	12	21·30	19·73	92·62	9·63	14·34	..
	,,	13	22·25	21·25	94·44	10·60	17·41	..
	,,	14	22·10	21·05	95·24	10·39	17·23	..
	,,	15	22·8	21·56	94·56	8·56	17·98	..
	,,	16	22·7	21·49	94·67	8·56	17·93	..
	,,	18	22·9	22·15	96·72	8·56	18·71	..
	,,	19	21·8	20·82	95·50	8·56	17·46	..
	,,	20	21·0	19·48	92·76	10·60	15·71	..
	,,	21	20·6	18·88	91·65	10·60	15·12	..
	Ratoon	12	20·6	19·25	93·44	9·16	15·83	..
Q. 116 ..	Plant	12	20·2	18·05	89·3	11·0	14·17	Arrows
Gingila ..	,,	13	20·55	18·85	91·7	11·0	14·89	,,
Q. 813 ..	Plant	12	21·40	20·41	95·37	11·36	16·52	,,
	Ratoon	13	23·20	21·38	92·10	11·50	16·83	,,
Q. 855 ..	Plant	12	19·60	18·69	95·35	12·06	14·97	,,
	Ratoon	12	22·40	20·48	91·40	12·84	15·78	,,
Q. 903 ..	Plant	12	19·80	18·76	94·70	13·00	14·80	,,
	Ratoon	12	22·10	20·45	92·50	10·00	16·48	,,
Q. 135 ..	Plant	12	18·20	16·25	89·28	9·36	13·00	,,
	Ratoon	12	21·00	19·14	91·10	10·38	15·24	,,
Q. 1001 ..	Plant	12	19·40	18·27	94·17	12·14	14·52	,,
	Ratoon	12	22·01	19·87	90·30	13·61	14·98	,,
Q. 1098 ..	Plant	12	20·10	18·89	93·98	8·12	15·65	,,
	Ratoon	12	22·10	20·34	92·00	11·34	16·10	,,
Q. 1092 ..	Plant	12	18·50	15·55	84·05	8·97	11·90	,,
	Ratoon	12	21·60	18·91	87·50	8·98	14·90	,,
Q. 1121 ..	Plant	12	20·30	19·30	95·07	10·22	15·78	,,
	Ratoon	12	21·00	19·26	91·71	11·74	15·09	,,
Q. 970 ..	Plant	12	21·10	19·93	94·45	10·29	16·27	,,
	Ratoon	12	22·30	20·79	93·23	9·96	16·80	,,
Hybrid No. 1 ..	Plant	12	20·30	19·41	95·61	9·38	16·10	,,
	Ratoon	12	19·30	18·35	95·07	8·14	15·38	..
Badila Seedling	Plant	12	21·20	20·19	95·23	9·44	16·70	..
	Ratoon	12	22·00	20·82	94·63	9·06	17·19	..
M. 87 ..	Ratoon	13	19·80	18·23	92·07	10·00	14·63	Arrows
M. 89 ..	Ratoon	13	18·30	15·88	85·13	9·69	12·18	,,
M. 55 ..	Ratoon	13	19·20	17·19	89·53	9·70	13·56	,,
Shahjahanpur No. 10	Plant	13	23·00	21·27	92·50	13·60	16·38	..
H.Q. 458 ..	Plant	13	19·30	17·21	88·90	..	13·36	..

B. 208 has not been included in the above table, for the reason that it has contracted disease in so many districts that it is rapidly going out of cultivation. Rappoe (Rose bamboo) and Striped Singapore still grow well on newer lands, but on older cane soils these varieties have been practically abandoned. In order that, if possible, they may be reinvigorated and become useful canes again, they are now being grown on an elevated situation on the tablelands near Cairns. From this spot they will ultimately be distributed to canegrowers by the Sugar Bureau.

Recommendations as to Varieties of Cane considered the most suitable for the different Sugar Districts.

Mossman.—N.G. 15 (Badila), 24 (Goru), 24a, 24b; D. 1135, H.Q. 426, Black Innis, B. 147, Q. 813, 903, 970, 1121, 1092, H.Q. 458.

Cairns.—N.G. 15, 24, 24a, 24b; D. 1135, H.Q. 426, B. 147, Q. 813, 903, 970, 1121, 1092.

Johnstone River.—N.G. 15, 24, 24a, 24b; D. 1135, H.Q. 426, B. 147, Malagache, H.Q. 458, Q. 813, 903, 970, 1121, 1092, 855.

Herbert River.—N.G. 15, 24, 24a, 24b; D. 1135, H.Q. 426, B. 147, Rappoe (on new lands), Q. 813, 970, 903, 1121, 1092, H.Q. 458.

Lower Burdekin.—N.G. 15, 24, 24a, 24b; D. 1135, H.Q. 426, 1900 Seedling, N.G. 22 (Mahona), Black Innis, H.Q. 222, Gingila, Q. 813, 855, 970, 903, 1121, 1092, H.Q. 458.

Proserpine.—N.G. 15, 24, 24a, 24b; D. 1135, H.Q. 426, 1900 Seedling, N.G. 22 (Mahona), Black Innis, Gingila, Malagache, H.Q. 222, Q. 116, D. 1135, B. 147, Q. 813, 903, 970, 855, 1092, 1121, H.Q. 458.

Mackay.—N.G. 15, 24, 24a, 24b; D. 1135, H.Q. 426, 1900 Seedling, Black Innis, Malagache, H.Q. 5, 114, 222, Q. 116, Gingila, B. 147, Q. 813, 903, 970, 1092, 1121, 855.

Bundaberg and Childers.—N.G. 15, D. 1135, Black Innis, 1900 Seedling, Malagache; H.Q. 222, 285, 297; Q. 116, H.Q. 426, Rappoe and Striped Singapore (on new soils), N.G. 40, N.G. 22 (Mahona), Q. 813, 855, 903, 970, 1092, 1121, H.Q. 285, Shahjahanpur No. 10.

Maryborough, Bauple, and Pialba.—N.G. 15, D. 1135, Black Innis, 1900 Seedling, Malagache; H.Q. 222, 285, 297; Q. 116, H.Q. 426, Rappoe and Striped Singapore, N.G. 22 (Mahona), N.G. 40, B. 147, Q. 813, 855, 903, 970, 1092, 1121, H.Q. 285, Shahjahanpur No. 10.

Moreton.—N.G. 15, D. 1135, 1900 Seedling, Black Innis, Malagache; H.Q. 222, 285, 297, 426; Rappoe and Striped Singapore, N.G. 22 (Mahona), N.G. 16, White Bamboo, Q. 813, 855, 903, 970, 1092, 1121, Shahjahanpur No. 10.

Logan and Nerang.—N.G. 15, 24, 24a, 24b; 1900 Seedling, Black Innis, D. 1135, H.Q. 285 and 426, Rappoe, Striped Singapore, Malagache, N.G. 22 (Mahona), Q. 813, 855, 903, 970, 1121, Shahjahanpur No. 10.

WEATHER CONDITIONS.

Hot, humid conditions are the best for the sugar-cane plant, and, fortunately, these generally obtain during the period of the maximum growth of the crop in Queensland. The wet season is usually synonymous with the three hot summer months of January, February, and March.

Although the weather is hot and humid during this period, the higher temperatures experienced in the dryer belts of Australia are not common. A temperature of 100 degrees is rarely recorded. It is unusual for the thermometer to show much above 90 degrees, even in the middle of summer. Indeed, during times of heavy rain, the weather becomes comparatively cool, but as soon as the sun reappears, the atmosphere becomes steamy and the growth of the cane is vigorously promoted.

On the coast of Queensland, where sugar is grown, the greatest rainfalls occur where the mountain ranges come close into the coast. Where they are considerably distant, as at Bundaberg and Ayr, the lowest precipitations take place. Consequently, the greatest amount of rain falls at Babinda and Innisfail, where the lofty ranges of Bartle Frere and Bellenden Ker are not far from the seaboard.

The following table shows the average annual rainfall in each of the sugar districts:—

District.	Average Annual Rainfall in Inches and Hundredths.	District.	Average Annual Rainfall in Inches and Hundredths.
Mossman	82·91	Proserpine	76·96
Cairns	90·49	Mackay	68·52
Mulgrave	81·91	Bundaberg	44·40
Babinda	165·00	Gin Gin	37·71
Innisfail	149·20	Childers	42·07
Ingham	80·53	Maryborough	46·14
Halifax	89·17	Pialba	38·04
Ayr	44·48	Nambour	60·93
Bowen	40·60	Beenleigh	48·87

Exceptionally heavy rains occur at periods that cause severe floods over the cane in low-lying areas. If the water subsides within two or three days, little damage may be done, but should rain continue and the cane remain under water for a week or more, the crop is often lost.

HUMIDITY.

The mean relative humidity or percentage of moisture in the air is a most important factor in the growth of cane. This is determined from the readings of the thermometer known as the "dry" and "wet" bulb. The dry bulb shows the external shade temperature of the air, while the wet bulb shows the external shade temperature of evaporation, and is kept covered by wet muslin attached to a reservoir of water by strands of cotton which keep the muslin supplied by capillary attraction. When the wet bulb under these conditions reads over 80 degrees the weather is exceedingly oppressive, and should it go up to 88 degrees it is regarded as highly prejudicial to human life. The table hereunder gives the percentage of relative humidity in the principal coastal towns in the sugar districts at 9 a.m.:—

Place.	Percentage of Humidity.	Place.	Percentage of Humidity.
Bundaberg	69·0	Innisfail	80·0
Mackay	75·0	Cairns	70·2
Ayr	68·0		

FROSTS.

These principally do damage to sugar-cane in those districts from Mackay southward. More or less severe frosts occur every few years in the Bundaberg, Gin Gin, Maryborough, Mount Bauple, and Nambour districts, while parts of the Mackay district are occasionally affected. In exceptionally cold seasons, frosts have done damage at Proserpine and Ayr, and traces of frost in such years have been detected as far North as Cairns, though, of course, no injury has been done the cane. When cane is badly damaged by frost, the whole of the leaves become dry and yellow and fermentation sets in down the stick, killing off the eyes. Unless such cane is quickly harvested and sent to a mill, deterioration sets in rapidly, the commercial cane sugar is greatly reduced, and it soon becomes unfit for manufacture. If possible, therefore, when cane becomes frosted, immediate arrangements should be made for its crushing.

DROUGHTS.

These rarely occur in the Northern sugar districts, and then only in a modified form. In some of the Southern sugar districts they take place periodically, and the only cure is an irrigation system.

CYCLONES AND HIGH WINDS.

Apart from damage caused by frosts, prolonged drought, or excessive wet, cane crops on the Queensland coast are subject to high winds. This naturally leads to much evaporation of surface moisture, although, as pointed out by Deere, winds blowing from the sea are often laden with moisture, increasing the humidity of the atmosphere and lessening the tendency to soil evaporation.

Hurricanes and severe blows are not infrequent, and may lead to partial destruction of both cane and leaves. The two cyclones which visited the canegrowing districts of Mackay and Innisfail in the early part of 1918 will be long remembered. Enormous damage was done to the cane crops.

The general effect of severe blows is to break the sticks if they have made much growth. In other cases the canes are twisted, which promotes shooting at the eyes. Leaves become stripped and torn and fail to be of the greatest benefit to the plant.

PESTS AND DISEASES OF CANE.

The sugar-cane plant is subject to many pests and diseases. The most serious of these at the present time is what is known as the grub pest. "The Grub" is the popular name given to the larvæ of the cane beetle. There are many kinds of cane beetles, probably about thirty, and of these four or five are more or less common. The eggs of the beetle are deposited in the soil about the cane and hatch into the grub, which commences feeding on the roots of the cane plant, doing in many cases an immense amount of damage by causing the stool to ultimately fall and perish. Thousands of tons of cane, particularly in the North, have been destroyed every year, and a high price per lb. is now paid for the beetles and grubs. In Mackay, over 15 tons of beetles have been captured within so short a time as two months, and destroyed.

This great pest is, at the present time, being investigated by Dr. Illingworth and a staff of assistants at Meringa, near Cairns, North Queensland, and conclusions are being arrived at as to the best methods of coping with the menace to growers. Various poisons have been used with more or less success, the use of arsenic having, so far, been attended with good results. It will be necessary to wait, however, till Dr. Illingworth's experiments are completed before definite conclusions can be arrived at.

BEETLE BORER PEST OF SUGAR-CANE.

The beetle borer or weevil borer, sometimes called New Guinea borer, has, during the last few years, done an enormous amount of damage, principally about Babinda and Innisfail, to the Badila cane. This weevil lays its eggs on the cane plant from which hatch out the grub or borer. This attacks the cane by boring into it, frequently making tunnels 18 inches or more in length, which it fills with chewed cane fibre and excreta. The grub is about half an inch long, and, when moving, forms a hump on its back; the head is brown. A description of the grub and beetle will be found in Bulletin No. 3 of the Division of Entomology of this Bureau, "Notes on Insects damaging Sugar-cane in Queensland," by Edmund Jarvis, copies of which may be had on application. The grub spins a cocoon of cane fibre, but previous to so doing, it eats a large hole in the rind of the cane to enable it to emerge. The pest is kept in check in Hawaii by means of a parasite known as the Tachinid fly. This fly has been liberated in North Queensland by the Entomologist, Dr. Illingworth. Unfortunately, the parasite has other enemies in the shape of spiders and ants. It is hoped, however, that the flies will ultimately render a good account of themselves.

The methods of minimising the borer pest usually recommended are—

(*a*) The immediate ploughing out of the stools from land which is to be spelled before replanting. These stools should be cut up and burnt;

(*b*) The immediate burning of the trash after harvesting;

(*c*) The most stringent inspection of cane plants or sets before planting;

(*d*) The collection of beetles (by means of traps of cut cane) and their destruction.

MOTH BORER.

The moth borer is also a pest of sugar-cane, but the amount of damage done has so far been comparatively light. The larvæ of this borer usually attack very young cane and kill the "heart." Where this is seen dying, the cane plant should be cut low down and the borer located and killed, as it frequently passes from plant to plant.

Other insects damaging sugar-cane will be found described in a Bulletin by Mr. Edmund Jarvis, which may be obtained free at the office of the Bureau of Sugar Experiment Stations, Brisbane.

OTHER DISEASES.

The gumming disease of the cane, caused by *Bacillus vascularum* (Cobb), is at times a very serious trouble, both in the field and in the mill, but, so far as the writer's experience goes, gumming of the cane is not found to any extent north of Mackay, and appears most prevalent in cooler climates. Sets showing gum should never be planted. Certain varieties of cane, particularly the older sorts, such as Rose Bamboo and Striped Singapore, are particularly liable to the disease, while in the best of the New Guinea canes no traces of it have been found, though the poorer kinds are far from immune.

Nematodes and fungoid diseases attacking roots have also caused alarm in places. The liming of the soil, change of plants, and rotation of crops, are the surest and safest methods for the elimination of these troubles.

[The End.]

PROSPECTS OF THE CANE CROP IN THE NORTH.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

''Throughout the month the cane-growing areas of Millbank, Bingera, Gin Gin, Maroondan, Avondale, and Bucca have been visited.

''MILLBANK.

''There is a marked absence of cane pests in this locality, and if the growers cultivate energetically now that the rain has come they will probably find that the heavier soil prevailing on the river bank will respond quicker than the volcanic of the Woongarra.

''It is hardly likely that the ratoons in these areas will come again to any extent, but the early plant cane should produce a fair crop for 1921. Farming operations were at a standstill during the early part of the month, but probably ere this the farmers are going ahead with planting.

''BINGERA.

''Great difficulty is being experienced by the growers in obtaining plants, those that are successful paying a very high price for them. There has been no change in the staple varieties grown, the farmers evidently considering that so far they are as satisfactory as any offering.

''GIN GIN.

''Splendid rain had fallen at the time of visiting Gin Gin, and the cane was just beginning to look bright and healthy.

''The D. 1135 is about the most hardy variety growing, although Clark's Seedling, under drought conditions, did fairly well. It is doubtful, however, whether any variety would have been alive had the drought lasted a month or so longer.

''As the rain was still persisting at the time of inspecting the Gin Gin areas farmers were taking the occasional hours of sunshine and getting on with their ploughing. With regard to agricultural operations, it was noticeable that the growers usually plough twice, let the land stand for about three weeks, plough again, harrow, drill, and plant. Generally plants with three good eyes are selected and placed in the soil, if a red volcanic, about 16 inches apart. Planting is usually closer if the soils are dark and heavier in humus. Usually speaking it takes about 16 cwt. of plants to go over an acre, but this depends on the nearness of the plant, a factor usually determined by the nature of the soil. The cane planter is almost invariably used. Subsequent cultivation of the cane after it has appeared above ground is usually carried on by machines fitted with hoes in preference to the disc. These remarks with regard to cultivation and ploughing apply practically to all the areas visited this month.

"MAROONDAN.

"The cane appears to have revived wonderfully after the rain, and should give a good yield of cane in 1921. No doubt, as soon as the weather clears sufficiently, the farmers will be hard at work preparing for the planting.

"AVONDALE.

"On the plantation side the cane looks well and Messrs. Young Bros. are energetically cultivating and ploughing. Most of the men engaged on the plantation are returned soldiers, who are working well and intelligently. With regard to varieties, Yuba has practically displaced the other canes, and seems to do very well on the river flats or sandy loam country. Nut grass is a considerable nuisance, although it is by no means out of hand. With regard to farm work, horses are mostly used for the ploughing, and the usual types of farm implements employed. Mr. Leaper assures me that excellent results are obtained from the use of the sulky plough.

"BUCCA.

"This place presents a most pleasing contrast to the time of last visiting. All the hills and valleys are clothed with heavy grass, and the cane is everywhere brightening up. Several growers were busy preparing for planting, but numbers have bought cows and are going in for dairying. Of the varieties that appear to make most headway in the district, D. 1135, Rappoe, and 1900 seem to be doing best. These canes tested a few years back 16.32, 16, and 17.05 respectively. It will be seen by these tests that cane grown here has a high sugar content."

RARE SUGAR FOUND IN HONEY.

Although known to occur in various forms, even, perhaps, as one of the constituents of the manna of Scripture, Melezitose is one of the rarest sugars. Minute quantities of it have been available to scientists for many years, but the supply has never been sufficient to permit of extensive experimentation. Now, by the aid of some Pennsylvania bees, many of which lost their lives, the United States Department of Agriculture has several kilograms of this rare substance, extracted and purified in the Bureau of Chemistry.

The bees in certain sections of Pennsylvania were storing up honey that crystallised, with the result that in the following winter seasons the bees were not able to digest it, and starved. The crystallised substance in the honey was found to be melezitose, which derives its name from *melez*, the French name for the larch tree, on which it was originally discovered in the form of honeydew. It also occurs in a sugary incrustation, or manna, on a leguminous tree in Persia and adjoining countries. Recently it has been found by the Bureau of Chemistry in a similar product on the Douglas fir in British Columbia. And now it has turned up in Pennsylvania, stored away in the honeycomb, in numerous hives. In this instance the following origin of the substance has been worked out:—

The scrub pine, and rarely other species of pine, are subject to attack by a plant louse and by a scale insect. In the course of their life activities these insects produce a honeydew which is rich in melezitose. In dry summers, after the white clover flowers have ceased to yield honey, the bees turn to this honeydew, and collect it; but it crystallises as fast as they store it away. This occurred in 1917 and 1918, and considerable losses were suffered by beekeepers. In 1919 the weather was so moist during July that no melezitose was gathered by the bees at all. But it probably will be collected in future whenever the summer is dry; and the honey of Central Pennsylvania may afford a permanent source of sugar previously so rare as to be only imperfectly known. The Bureau of Chemistry extracted considerable quantities from the honey of 1917 and 1918, and is making extensive experiments with it. Rare as it has always been, there is a definite demand for melezitose for use in scientific laboratories. It can be distinguished from other sugars by certain peculiarities of crystallisation observable with the polarising microscope.—"Weekly News Letter," Washington, U.S.A.

The Orchard.

WALNUT-GROWING IN CALIFORNIA.

We have received from Mr. H. C. Kegley, Los Angeles, California, an exhaustive and informative paper on the cultivation of walnuts in California, and regret that our limited space will not admit of its publication as a whole.

That walnuts will grow, thrive, and produce heavy crops has long ago been satisfactorily proved on the Darling Downs, and we know of one tree, situated at the lodge gates of the Toowoomba Grammar School, which produced annually a heavy crop of nuts. The Pecan nut, which we take to be a kind of walnut, does equally well on the Downs. Had walnut trees been liberally planted by the early settlers in that district, there would have been no need to import nuts from Europe which have lost most of the attributes of the freshly-gathered fruit.

The chemical analysis has shown that a pound of walnuts contains more proteins than a pound of wheaten flour or potatoes, more fats and carbohydrates than a pound of beefsteak, more fuel value than a like amount of either, and a much smaller percentage of water. It is stated that in California there are now upwards of 60,000 acres of walnuts in bearing.

Walnuts come into bearing at from five to nine years after planting. On account of the wide spread of the full-grown tree, they are usually planted about 17 to the acre, or 60 feet apart in the row. There are groves in California which produce more than 2,000 lb. of marketable walnuts to the acre each year, and the average yield for the whole State in 1918 was 1,300 lb. from twelve-year-old trees. The writer then goes on to give the cost of planting, cultivation, fertilising, pruning, harvesting, &c., which is reckoned at from £8 to £12 per acre.

An idea of the vastness of the walnut business in California may be gained from the fact that last year's crop amounted to 37,000,000 lb. A full description of the machinery employed for husking and cracking the nuts is also given. Singularly enough, prior to the war cornmeal and other finely-ground products were being used by high-explosive makers in the manufacture of dynamite, &c. An experimental grinding machine was devised to reduce walnut shells to a powder which would take the place of cornmeal. Forty thousand dollars (£8,000) were spent by a powder concern on this machine, and it now buys all the shells turned out from a walnut by-product factory at 10 dollars (£2) per ton. The walnut industry of California is growing at the rate of about 2,500 acres per year.

Mr. Kegley also sent us seven very fine photographs illustrating the industry, which we should have been glad to reproduce.

KILLING RABBITS WITH GASES FROM MOTOR-CAR.

A recent report in this paper, explaining how Mr. Walter Hawker, of South Australia, had exterminated rabbits by utilising the exhaust gases of a motor-car, led Major C. Mills, of the "Panshanger" Estate, Northern Tasmania, to experiment with the same means. He took the silencer off the car, connected about 8 ft. of galvanised iron piping to the exhaust pipe, and to the end of that attached 18 ft. of 1¼ in. suction hose, which was placed in the burrow, and the mouth of the latter closed up with sand. The throttle of the engine was opened one-quarter, and in a few seconds gas appeared from several holes in the ground. These were stopped, and the engine allowed to run for three minutes. After a further two minutes the burrow was dug out, and five dead rabbits were found. After trying the method for ten days Major Mills found that not one of the gassed burrows had been reopened by the rabbits. He used a six-cylinder car, and considers it an economical and effective way of dealing with the pest. He advises that all holes of a burrow should not be closed up entirely, as otherwise the gases might not extend to the extreme end of the warren. To increase the volume of smoke he cut a small hole in the exhaust pipe, and squirted in a little crude oil.—"Pastoral Review."

Botany.

TWO NATIVE DROUGHT-RESISTANT FODDER PLANTS.

By C. T. WHITE, F.L.S., Government Botanist.

PSORALEA TENAX, Lindl. A "Wild Lucerne."

Mr. W. B. Wilson in a letter under date of 1st December, 1919, from St. Ruth, Dalby, wrote—" I forward under separate cover a specimen of a plant which is growing on St. Ruth, and which I am anxious to know more about. We call it 'Wild Lucerne,' and it is growing well now, although the country is drought-stricken; it did the same in the 1915 drought, and my stock horses and cattle trimmed it all down eventually. There is dry grass in some paddocks with this plant, and my horses seem to mix the two, and as a result they are in tip-top condition and as glossy in their coats as if on grain. A taproot goes straight down for several feet, and the plant seems to spring out of the crown every year and also to keep shooting out as it is fed down—the same as lucerne." Later (11th December, 1919) he wrote—" If I had this plant growing all over the run at present, the dry weather would not worry me so much, as its growth is wonderful, and this is no doubt accounted for by the length of the taproot."

A few notes on the genus Psoralea will be found in a previous article in this Journal for December, 1918, in which attention is drawn to the fodder value of another species—*P. cinerea.*

Psoralea tenax is an inhabitant more especially of the heavy blacksoil country of the Darling Downs, but is also found on the coast, though the coastal forms are usually more straggly and weaker in growth than the inland ones.

GALACTIA TENUIFLORA, Willd.

Writing under date of 25th November, 1919, from Meadowbank Station, Mount Garnet, N.Q., Mr. L. Illin, in a letter to the Minister for Agriculture (Hon. W. N. Gillies), stated—

" I am living in a drought-stricken area (Mount Garnet district), and all around cattle are perishing in hundreds, the grass is as dry as powder and straw. Yet, in the middle of this dry straw, you can sometimes see a green patch. If you drive cattle you will notice them going for every plant they can find, and eat it with avidity. The horses will pull the reins out of a man's hands; and, never mind how you urge them on, they must have a mouthful of it. The vines make splendid hay as good as lucerne. I have noticed its growth, and we have only had 8 points of rain since July. I think this plant is a means of increasing settlement and production of stock. I have seen one of the vines inside of a tank fence away from stocks' reach several pounds in weight on the one taproot. A native plant of the district, if it lends itself to cultivation, should prove a greater success than an imported one."

Galactia is a genus of about fifty species, mostly natives of America. Our species (*G. tenuiflora*) has a very wide geographical range, being found in one form or another throughout Tropical Asia, Africa, and America. J. G. Smith, in Bulletin No. 2, Division of Agrostology, United States Department of Agriculture, records the genus as containing several valuable fodders, one (*G. canescens*, the Miller Bean) being particularly valuable for arid regions.

Considerable interest is now being taken in native fodder plants, particularly those of a drought-resistant nature, and the above notes on two such plants seem worthy of record. The accompanying illustrations should aid persons interested in recognising the two plants referred to, should they come across them at any time, or should they have them growing on their properties.

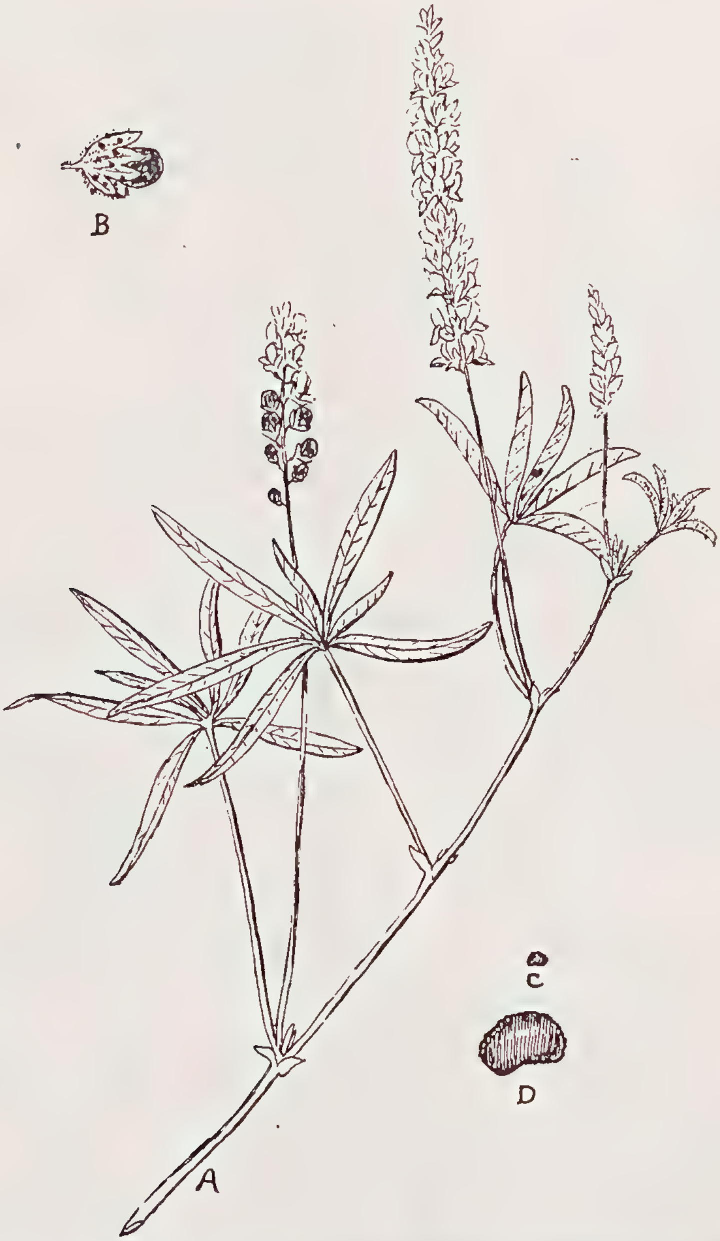


Plate 6.—Psoralea tenax.—A "Wild Lucerne," also called "Emu Grass"
A. A shoot (natural size). B. Calyx and pod (enlarged).
C. Pod (natural size). D. Pod (enlarged).
The pod contains one seed, which fills the whole of it.

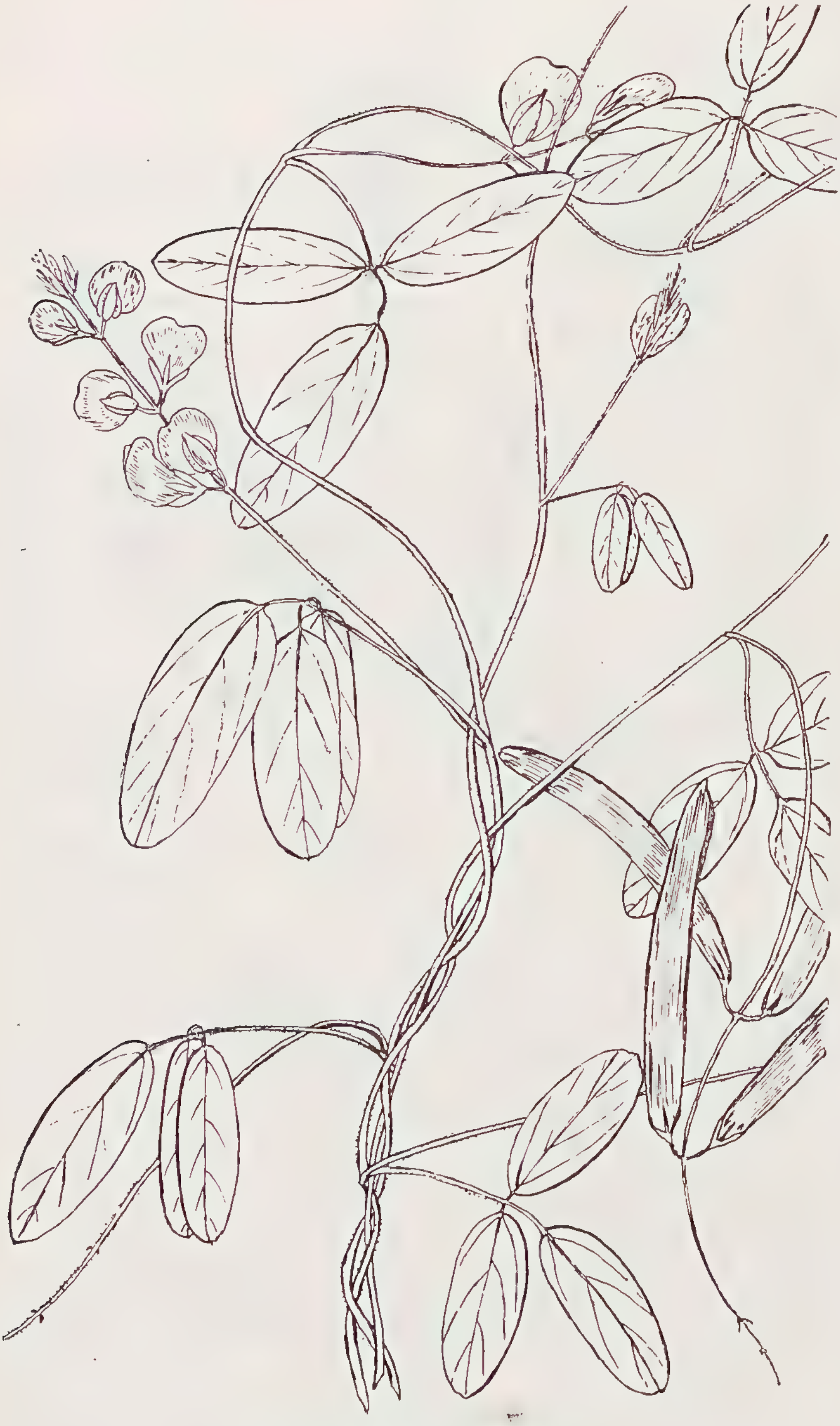


PLATE 7.—GALACHA TENUIFLORA.

A useful forage vine. The specimens figured represent rather a broad leaved form of the species.

Forestry.

KILLING TIMBER WITH ARSENIC.

The use of chemicals for the destruction of undesirable timber on agricultural selections has been advocated by some and condemned by others. Here is the experience of Mr. E. E. Ward, Wattle Park, who writes (2nd February, 1920) :—

"During the last month I have had several inquiries regarding arsenic for killing timber, as I have been trying it in various ways for the last four years; and, perhaps, my experience may be of use to readers of the 'Queensland Agricultural Journal.'

"I have had a variety of timber, such as box, yellow jacket, broad- and narrow-leaved ironbark, and various kinds of scrub, including a species of wattle which is very hard to get rid of in this country, and I have found the arsenic a decided success. Under favourable conditions, it will kill 98 per cent. of the trees operated on; and under very bad conditions, such as a dry season, and with such timber as small box seedlings up to 6 inches in diameter, which had been scorched by a bush fire going through it, yet on the application of the arsenic 90 per cent. died, and only a small percentage of those that suckered threw out healthy ones.

"In my experience, the best way to use the arsenic is to use 1 lb. more than has been recommended by the department. In mixing a 10-gallon lot, see that the arsenic is thoroughly dissolved, and do not trust a boy to make the solution or apply it, as, in my experience, it is on the thoroughness with which this part of the operation is done that the success or failure of the operation depends.

"My plan is to cut down anything that can be easily felled with four or less axe chops, and spray the sapwood and bark of the stump cut off, say, 6 inches above the ground. With bigger timber I frill-ring it about 6 inches above ground, but do not wrench the chip out any more than necessary to make an opening for the arsenic solution. By wrenching the chip too much the bark is split, and a certain amount of the solution is lost. The solution must be applied all round the tree and the cuts well wetted. Don't try to get over too much ground, but do the job thoroughly. Should any of your readers wish for further information, I shall be very willing to give them the benefit of my experience, as I have had excellent results."

AN INCH OF RAIN.

What does an inch of rain mean? Few persons have any definite idea. An acre, if calculated out, will prove to be 6,272,640 square inches. One inch deep of water on this acre will be as many cubic inches of water, which, at 231 to the gallon is equal to 27,154 gallons. This immense quantity of water will weigh 228,190 lb., or 114 tons. One hundredth of an inch (.01) alone is equal to over 1 ton of water to the acre. Inches, and fractions of an inch, are represented by a whole number, say, 1 or more. To denote the fraction, a full stop follows the whole number, thus 1., and the figures representing the fraction then follow. One and a-quarter inches is written 1.25; one and a-half inches, 1.50; one and three-quarters, 1.75, and so on up to 100, which makes the second inch. One inch of water equals over 100 tons per acre. During the month of January, 1901, there fell, at Geraldton, in forty-eight hours, 15½ inches of rain. This was equal to 420,837 gallons per acre, or 1,767 tons, about one-seventh of the total quantity required to irrigate a crop of sugar-cane during the whole growing season.

Neglected Industries.

SILKWORMS.

Last January a letter appeared in one of the Brisbane newspapers advocating the use of the Eri silkworm as the most suitable, both as regards silk production and feeding, for establishing the silk industry in Queensland. Apart from the value of Eri silk, a great advantage is, that instead of feeding on mulberry leaves, its principal food is the castor-oil plant, which grows in profusion all the year round in the coastal districts of Queensland, and thus provides, all the year round, abundance of cheap food, when the mulberry leaves required for the ordinary silkworms which have been raised in Queensland are unobtainable.

There are three descriptions of silkworms which, as far we know, have never been introduced to the State. These are mainly raised in India, under the names of Muga (*Antherea assama*), the Tusser (*Antherea mylitta*), and the Eri (*Attacus ricini*).

THE TUSSER.

The Tusser is a bi-voltine silkworm—that is to say, it goes through all its metamorphoses twice in the year. These worms are also semi-domesticated, or, in other words, the eggs are hatched indoors, the worms then being allowed to feed on the trees by themselves, instead of on leaves plucked for them.

In India, the first generation of moths emerges from the cocoons about the beginning of the rainy season (June), from cocoons which have lain dormant since the previous autumn, and lay their eggs; the caterpillars from these eggs complete their cocoons, and the moths emerge about August. The offspring of these moths produce the second crop of cocoons by the end of the rainy season (September), and these cocoons remain dormant throughout the winter, a period of over seven months, and produce moths in the following June, and so the cycle goes on.

The worms hatch out about the ninth day. They live and feed from about thirty to forty days, passing through five moults, or changing of the skin, at intervals of five to eight days, then spin their cocoons, and finally, after seventy-one days from the commencement of spinning the cocoon, the moth cuts out.

The caterpillars, at the end of their larval existence, are usually about 7 inches in length. The cocoons are very compact in structure, containing a very large amount of a coarse, buff-coloured silk, and of immense size, reaching as much as 2½ inches in length by about 1¼ inches in diameter.

The Tusser worm feeds on a variety of plants, some of which are plentiful in Queensland. The two principal ones are *Shorea robusta* and *Terminalia tomentosa*; the latter only is found in Queensland. Of the Terminalias, or allied plants, we have several, especially in the North of the State, all of which are suitable for food, and many others too numerous to mention. Lastly, there is the common castor-oil plant.

In India, the Tusser worm is allowed to feed on the trees out of doors, but a constant watch has to be kept to keep off birds and insects. It is possible to rear these worms entirely indoors, if they are copiously watered once a day with a watering can to imitate the heavy monsoonal rains. Plates 8 and 9 are very good illustrations of the Tusser male and female moths, and of the cocoon and worm.

THE MUGA.

Like the Tusser, the Muga is a semi-domesticated silkworm, but very much more so, as the eggs are hatched indoors, and the cocoons spun indoors also, the worms only being allowed to feed in the open, and brought indoors when about to commence spinning. They are then placed on bundles of twigs prepared for the purpose. It is

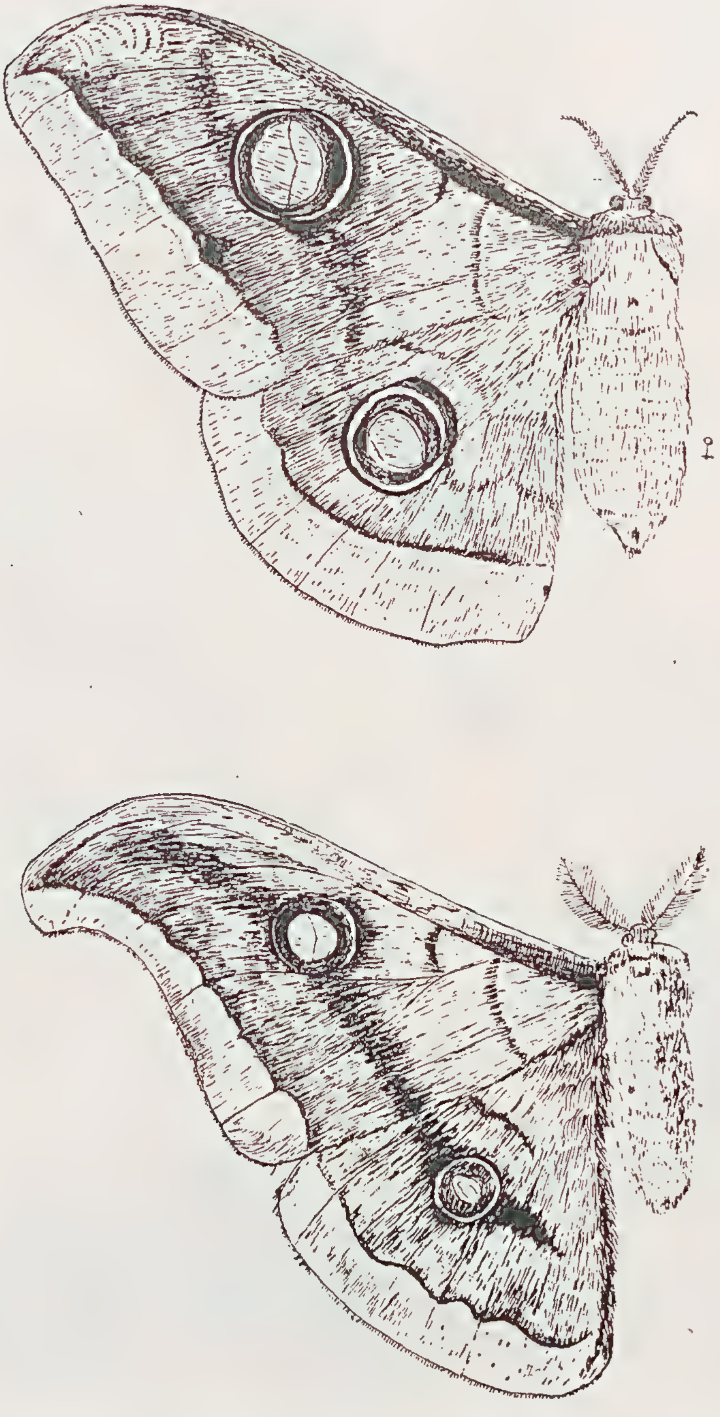


Plate 8.—Tusser Male and Female Moths.

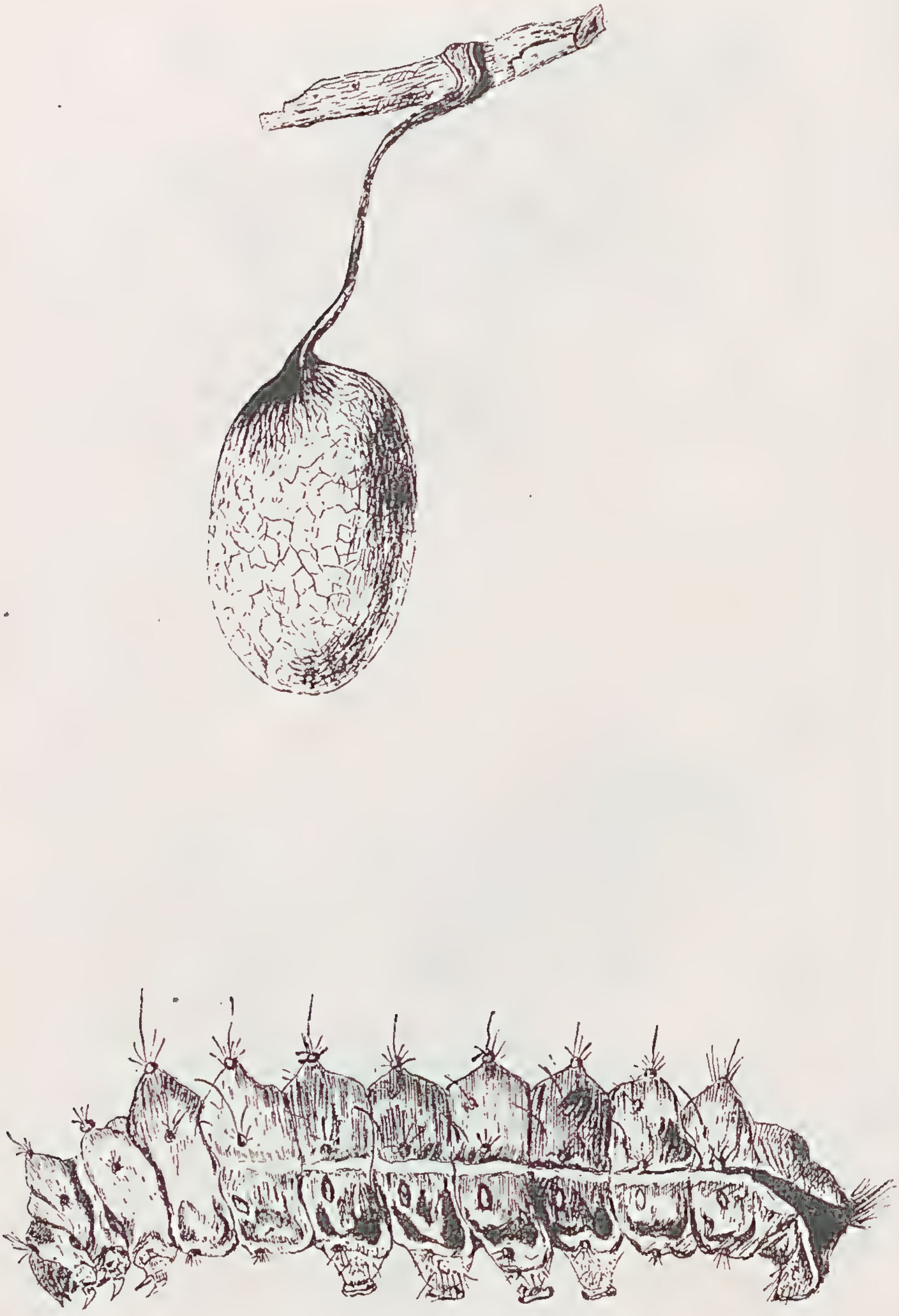


PLATE 9.—TUSSER COCOON AND WORM.

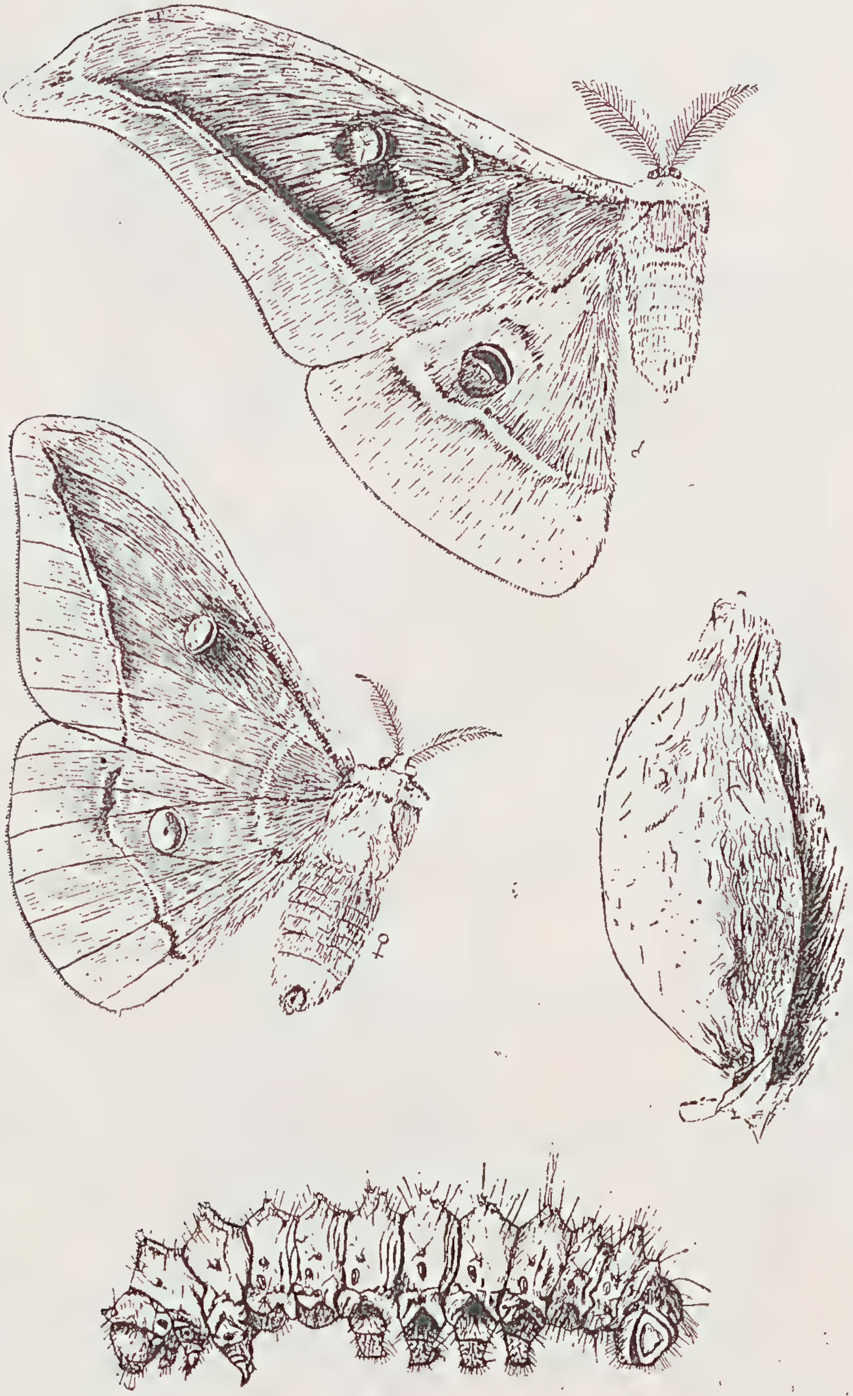


Plate 10.—Muga Male and Female Moths, Cocoon, and Worm.

believed that the worm can be entirely reared indoors. The Muga worm moults four times, and takes from thirty to forty days, according to temperature, to reach the spinning period. The chrysalis stage lasts from fifteen to thirty days, a complete generation occupying from two to three months, according as the weather is warm or cold. The Muga is a multi-voltine worm, usually going through five generations during the year. Each female moth produces about 250 eggs. The full-grown worm measures about 5 inches in length, and is about as thick as the forefinger. Its colour is green. The cocoon is nearly 3 inches in length by about 1 inch in diameter. The silk is much more valuable than that of the Tusser, and there is a considerable demand for it in Europe.

The Muga silkworm's favourite diet, and chief food, consists of the leaves of *Machilus odoratissima*, which is not found in Queensland, although there are several allied plants known as Laurinæ, which would doubtless do as well. *Tetanthera monopetala* is one of them, and another is the *Sarcostemma brevistigma*, found all over Queensland growing amongst the mangroves or near the beach, its common name being " Caustic Vine." The castor-oil plant is also used. The worms are raised in a similar manner to that described under " Tusser."

Plate 10 illustrates the Muga male and female moths, cocoon, and worm.

THE ERI.

The Eri is a multi-voltine silkworm, reared entirely indoors in a similar manner to the ordinary mulberry worm. Although as many as eight generations can be gone through in a year, not more than five are usually reared. The female moth lays about 200 eggs, which, in favourable weather, hatch out in about ten days from the date of being laid, and a month from hatching sees the worm full grown—during this period passing through four moults—when it commences spinning its cocoons. The moth emerges in from about two weeks to one month, according to temperature. The worm, on hatching out, is about ¼ inch in length, and appears nearly black. As the worm grows, the colour changes with each moult, ending in a dirty white or dark green. The full-grown worm is 3½ inches long. The cocoon is 1½ inch long by ¾ inch in diameter, of a white colour, although sometimes worms of the same brood, fed on the same food, will turn out brownish-red cocoons. The cocoon is somewhat loose in texture, but the silk is very strong.

The principal food of the Eri is the common castor-oil plant. It also feeds on the leaves of the umbrella tree of North Queensland, on the physic nut plant, and the *Ziziphus jujuba*.

A well-developed castor-oil plant will, after a season's growth, yield 14 lb. of leaves, so that an acre containing 2,732 plants, will supply 38,300 lb. of leaves, sufficient to feed 600,000 silkworms in a season.

The value of Eri cocoons has risen considerably, and the demand in England is greater than the supply. The cocoon, before the Great War, was worth 3s. per lb. dried, and, what is of great importance, no exception is taken to pierced cocoons —indeed, these latter are preferred, as there is no need to choke the chrysalis, as in the case of the mulberry silkworm.

Plate 11 is a good illustration of the Eri male and female moths, cocoon, and worm.

As stated, 1 acre of castor-oil plants will support 600,000 Eri silkworms during the year—that is, six broods of 100,000 each. Allowing for deaths, &c., these will produce 450,000 cocoons. One thousand six hundred cocoons go to the lb.; therefore, 1 acre of land will produce 300 lb., which, at 3s. per lb., amounts to £45. Roughly speaking, to put 1 acre under castor-oil, and to rear the worms, should not cost more than £15, leaving a net profit of £30 per acre. There is no work connected with silkworm rearing which cannot be done by women and children, once the castor-oil has been planted.

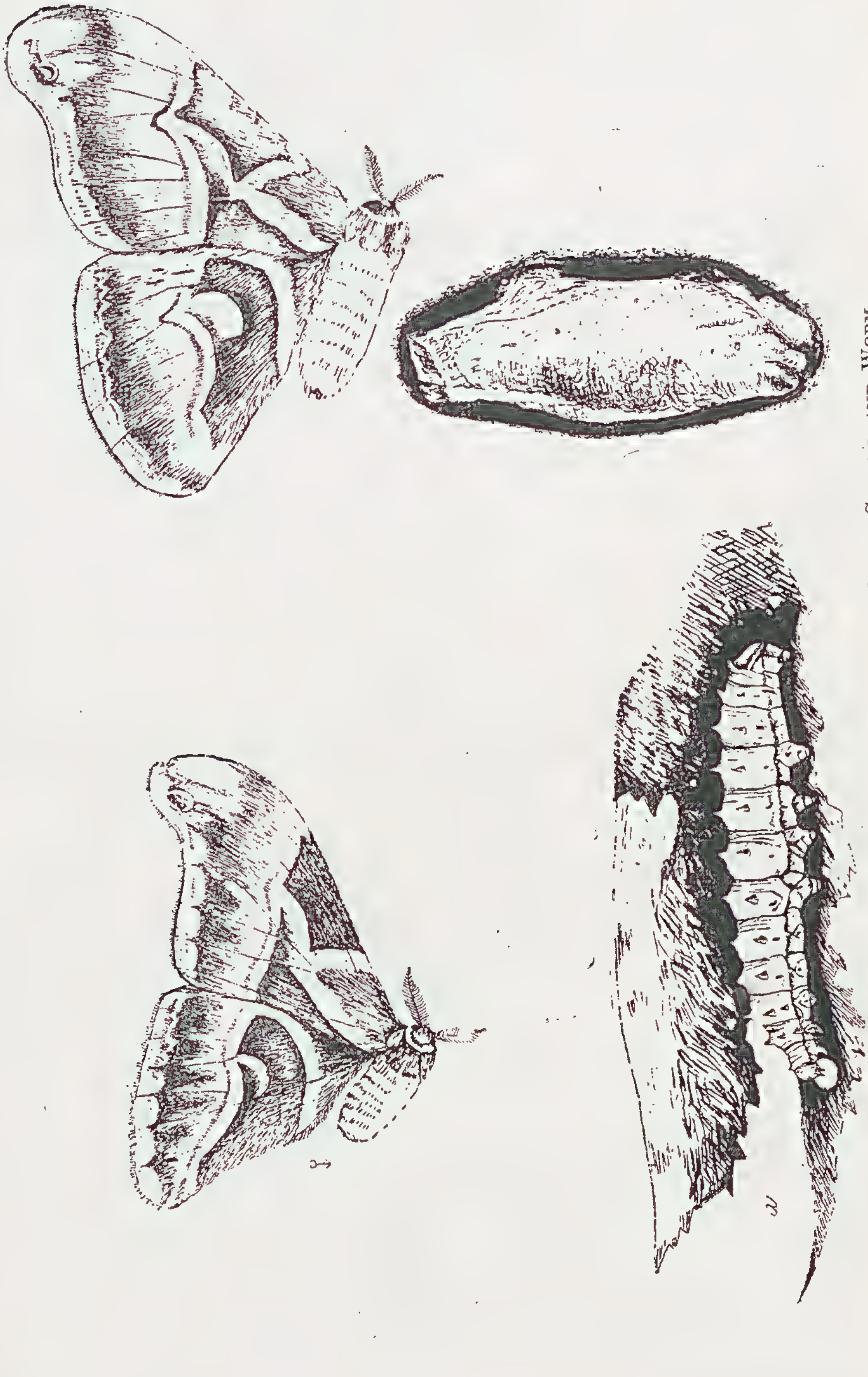


Plate 11.—Eri Male and Female Moths, Cocoon, and Worm.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation, January, 1920, from Dr. J. F. Illingworth, Entomologist to the Bureau:—

"Rains have set in at last in the Cairns district. The terrible drought continued until the 13th of January, with fatal results in some of our cane areas. The high-lying ground composed of red soils suffered most, since this land is naturally dry; and the ratoon stumps have many of their roots destroyed by former attacks of grubs. Most plant-cane, where it has been well cultivated, resisted the drought remarkably, though there has been no appreciable growth. Naturally, we must expect a late-maturing crop next season, with a considerable shortage.

"The continued dry weather has increased the injury resulting from the attacks of the grubs of *Lepidiota frenchi*, which, it will be recalled, is a species that has a two-year life cycle. Fortunately, this species has a rather limited distribution in the canegrowing areas, for it favours the wild grass lands.

"In spite of the hardness of the ground, a few beetles have succeeded in escaping from their pupation chambers, and are to be found on the feeding trees, though in many cases the newly-emerged beetles succumbed soon after reaching the surface, and before they are able to fly away. This is evidenced by their dead bodies, which are seen lying about in the fields.

"I have not been able to get away from the Station for any extended periods recently, hence my visits to other districts have been greatly curtailed. Shortly, however, I hope that this important feature of my work may be resumed, now that Mr. A. P. Dodd has returned from war service overseas. In this connection, I have been particularly anxious to continue the breeding and distribution of the beetle borer parasites (*Ceromasia sphenophori*), which are doing such excellent work in the Mossman district. The beetle borer (*Rhabdocnemis obscurus*) is spreading rapidly in the more humid districts of North Queensland, and demands immediate attention. It is a pest second in importance only to the cane grubs.

"EMERGENCE OF BEETLES.

"Though there has been a straggling flight of beetles, in spite of the drought, as indicated above, we are watching with interest for the effect upon the general emergence, now that the rains have set in. It is noteworthy that most of the beetles that have appeared on the feeding trees are considerably rubbed, indicating that they had great difficulty in escaping.

"MERINGA PLOTS.

"The soil in this area is exceedingly dry and hard, and as a result of the drought and injury by stock, which repeatedly got into the field, many of the stools are dying out, so that we can expect a poor ratoon crop. With a normal year, however, this would have come away splendidly, treated by bursting up the centres with the plough. In this case I threw the soil to the cane to prevent exposure of the roots during the excessive dryness; and plan to plough away after the rains, before scarifying. In the case of those plots which are to be treated with poison, I shall apply it in the drill on each side of the stools, where the grubs will find it most readily, if they come to feed upon the roots.

"GREENHILLS EXPERIMENTS.

"Though I had to forego an extensive line of experiments on late-planted cane, because of the unfavourable weather conditions, I am replacing these with experiments on ratoons in the infested area. A ton of arsenic, which I received recently from the South, is being used in this way.

"In one field of 5 acres I saved all the trash, which the cutters placed mostly in alternate rows. The free-middles were cleared up with pitch-forks before bursting them open with the plough. Arsenic was then dusted on the alternate trash rows. By this method I hope to conserve the humus of the trash; then the beetles, if they emerge abundantly, will crawl under these piles to oviposit. In this way the grubs will be centralised where they will readily find the arsenic while they are developing, and before they do serious damage to the cane roots.

"In these experiments I used 20, 40, and 60 lb. of the poison to determine how much is necessary to prevent the ravages of the grubs and to see if there are any detrimental effects to the cane from its use. Two of the acre plots were kept as checks—no poison being applied, though they are to receive the same treatment otherwise."

RAINS BENEFICIAL TO THE CANE CROPS.

On his return to Brisbane from the Bundaberg and Gin Gin sugar districts, the General Superintendent of the Bureau of Sugar Experiment Stations stated that the recent bountiful rains had effected a highly beneficial change in the appearance of the cane crops. The young cane was now a beautiful green colour and was growing vigorously. The early planted cane was doing remarkably well in many portions of the Bundaberg area, and if conditions remain favourable, and the winter is not too severe, there should be a fair crushing season in this district, though it will probably be a late one. At the Experiment Station the various experiments were looking exceptionally well. Some interesting field trials are being made with different quantities of pulverised limestone, from 1 to 6 tons per acre being used. Experiments with using plants cut from plant cane and 1st, 2nd, and 3rd ratoon cane are also being made, as well as using sets for plants from different portions of sticks of cane.

The new cane varieties from Java, Mauritius, India, and Hawaii are looking well and arousing considerable interest, particularly the Indian cane known as Shahjahanpur No. 10, which has successfully resisted frost during the past two seasons. The cane known as Q.813, which has been distributed from the station, is coming into great favour, and the Fairymead Sugar Company are stated to have planted 100 acres of this variety. A large number of applications for this cane and the Shahjahanpur are still being registered.

At Gin Gin the cane, though of fine appearance, is more backward than at Bundaberg, and the rainfall to date has not been so great. The spring planting, however, was much larger than usual, and many fresh areas have been planted up in order to keep the mill going. The cultivation has been very good, and the young cane is beautiful, the district generally looking a picture. The river flats are green with fine crops of cane, lucerne, and corn, all doing splendidly. This area comprises some particularly rich soils.

CULTIVATION OF PAPAW FOR PAPAIN.

A correspondent lately wrote asking us to publish instructions for extracting papain from the papaw fruit. We cannot do better than supply the information as given in the "Year Book of the Ceylon Agricultural Society" for 1919-1920, by J. S. de Silva, C.A.S., who prefaces his paper on the subject by directions for sowing the seed, transplanting, &c. The seed, to ensure germination, is covered in the seed bed with rubbish which is set on fire. Another method is to cut down the scrub growth, throw the seed among the heap, and set fire to it; then clean away the resulting rubbish, leaving as much of the ash as possible. The seeds, thus treated, soon sprout out, and the ash serves as manure. Fresh seeds take from ten to fifteen days to germinate, while old and much-dried seeds take from one to two months. For the purpose of obtaining papain, the fruits are tappable when three months or more old.

In extracting the latex the fruits should not be scarified with steel knives, but bone, glass, or ivory, or a sharp-edged piece of bamboo should be used for the purpose, and the juice collected in china or earthenware containers and promptly dried. It coagulates naturally, forming a resinous-looking, granular mass, and is then dried in the sun. It must be dried rapidly, otherwise it putrifies and gives off an unpleasant sour odour. To obviate this, a trace of formalin should be added to the juice when collected. Early morning is the best time to tap, the flow then being more abundant.

The dark colour assumed by the latex in sun-drying is due to exposure to air and light, and also to smoke-drying during wet weather, but this does not affect the purity of the stuff, although it is objected to by dealers. Pure, light-coloured papain can be obtained by rapid drying in a hot-air chamber, while the putrefaction of underdried latex can be prevented by treatment with formalin. The time required for drying depends on climatic conditions. On an average, under ordinary circumstances, it takes from three to four days. This can be reduced by artificial drying to one to two days. The use of an unused, fresh earthenware vessel is found best, owing to its power of absorbing moisture and consequent rapid drying. When the granular papain is crisp, like biscuit, and crushes easily between the fingers, it is fit to be bottled up for export.

The fine varieties of papaw trees do not bear so heavily as the native papaya tree. The former yield from fifteen to twenty fruits and five of them hardly yield 1 lb. of dried papain, whereas the common sort, carrying thirty to forty fruits, have been known to yield 1 lb. per tree. Packing papain for export must be in wooden cases lined with tea lead, with a second inner lining of oil paper. After folding the paper over the top, the lead seams should be soldered before nailing down the cover.

General Notes.

THE PRICE OF SILVER.

Silver is now quoted in London at 7s. 7½d.

We have no information as to the output of the silver workings at Indooroopilly, but doubtless holders of mining rights in that district will be encouraged to energetically develop the existing lodes and to prospect for others.

NEW TEXTILE FABRIC.

It is stated that the Premier of New South Wales (Mr. Holman) has received a copy of the "United States Commerce Reports," dated 27th October, in which reference is made to a new textile fabric which, it is claimed, will tend to lower the present high cost of men's clothing. A new fabric is being placed on the market, says the United States Trade Commissioner in London, by Mr. Pudsey, the Yorkshire manufacturer. London agents for the manufacturer state that the new cloth is made entirely from silk voile or short fibres. Whilst it is superior in wearing properties to pure worsted, it can be sold at the price of shoddy cloth, or one-fourth the price of best wool fabrics. It is said to be strong and almost untearable, and very suitable to hard wear, and can be obtained in greys, browns, and blacks. The new fabric is claimed to be a British discovery, and at present manufactured by only one firm.

KILLING RATS IN THE PACIFIC ISLANDS.

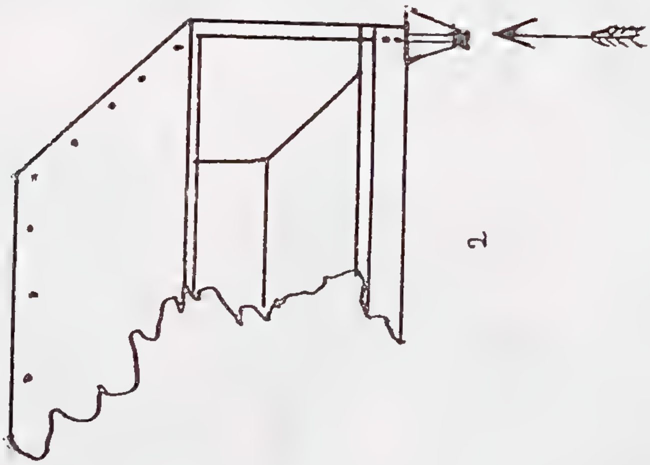
Rats cause a large amount of damage among the cocoanut trees in the Pacific Islands, and many different ways have been tried to cope with them. They make their nests in the top of the trees, and attack the young nuts, sucking out the juice. On one island they imported many years ago a large number of terriers; these multiplied rapidly, and had no effect on the rats; they fought among themselves and lived on crabs and shell fish. Then 400 cats were imported; these neglected the rats and took to fishing, catching with their paws the young fish. Now the cats and dogs have nearly all been destroyed. Lastly, minahs were imported from North Queensland and Borneo. These birds have been most successful. Not only do they kill and eat the young rats, but even attack the old ones and kill them. A friend from the Pacific informs us that the rat difficulty is solved when minahs are brought in numbers to an island.—"Pastoral Review."

A BIRD SCARE.

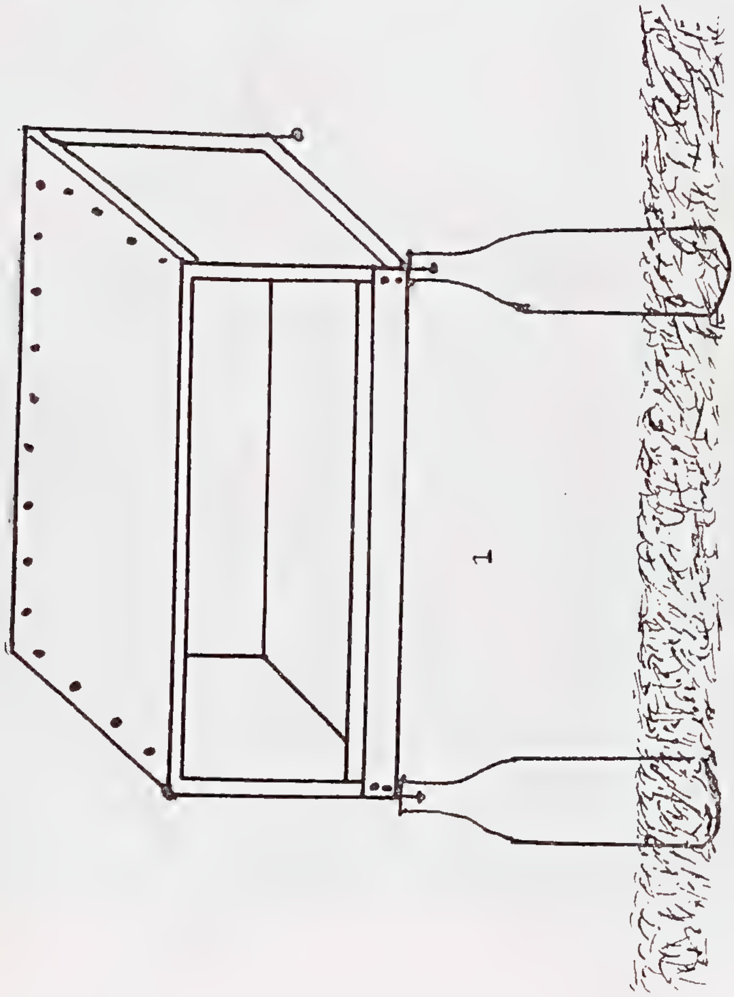
The increase of sparrows, especially in the suburban districts around Brisbane, and other cities and towns of Queensland, has caused several amateur and professional gardeners to set their wits to work to evolve some efficient means of driving them from their destructive work. The accompanying sketch shows a very simple but effective scare, devised by Sergeant Auld, Kangaroo Point. The accompanying photograph of the apparatus shows it suspended over a garden bed where it revolves windmill-like with the slightest breeze from any quarter. We might suggest that a few feathers attached to the "sails" would add to the scaring effect on the depredators.

A BUSH SAFE FOR SELECTORS.

We have received from Mr. L. Ghizzo, a selector at St. Helens, Mackay, the following description of a safe to protect the contents from ants and other pests. The idea seems to be a very good one, and as will be seen by the accompanying illustration, of very simple construction.



2



1

Diagram No. 1 is applicable to a bush home with an earthen floor, and is made as follows:—Take any kind of a box and procure four bottles, one for each corner of the box, and sink them perpendicularly into the ground to a depth of 3 or 4 inches. Then drive a long nail half way into each corner of the box, leaving half of the nail projecting, which will fit into the neck of the bottle as shown in the diagram.

Diagram No. 2 shows a safe for city use and boarded floors. This is almost similar to No. 1, with the exception that the box is turned over and a cork is driven in with a nail into each corner. The box is then turned over and the corners with the corks attached are then placed in the bottles. All that is needed afterwards is to rub the bottles daily.

DUTCH NEW GUINEA.

A fortnightly commercial review, entitled "The Dutch East Indian Archipelago," in its issue of 20th November, 1919, amongst much valuable information on the trade and possibilities of trade between Australia and Java, Sumatra, Borneo, Celebes, &c., gives a very interesting account of the acquisition of that portion of Papua not within the British jurisdiction, and of the progress made there in late years. This little historical sketch, although not treating of agriculture and stock, gives a very fair idea of North-Western New Guinea and its resources, and should prove of interest to Australians, especially those interested in tropical products such as copra, tobacco, rubber, sugar, rice, &c., &c. The article reads as follows:—

THE NEW RESIDENCY OF NEW GUINEA.

Although the western half of New Guinea, previously a domain of the Sultan of Tidore, has been many times visited by our ships during the past century, yet, until the year 1823, it had never been officially proclaimed a possession, neither had any settlement been attempted there.

However, Mr. Merkus, at that time Governor of the Molucca Islands, saw that it was imperative to annex the Western portion of New Guinea, as being the Eastern key to the Moluccas, and in order to protect the islands on that side from foreign invasion. Consequently, on the 24th August, 1928, the Western part of New Guinea, up to 141 degrees E. L., was formally proclaimed a "possession," and the fort "du Bus" built in Triton Bay on the south-west coast, while the name of Merkusoord was given to the surrounding country.

The choice of place, however, soon proved to be an unlucky one, on account of the unhealthy climate, which produced such a high rate of mortality that, after ten years, it became necessary to abandon the settlement. The fort was then pulled down and the whole of the coast deserted.

Later on, this official proclamation regarding Western New Guinea proved to have been by no means premature, as England afterwards took possession of the Southern and Eastern part, and in 1885 Germany occupied the North-East portion, now a protectorate under the Australian Commonwealth. The boundaries of Dutch and English New Guinea are regulated by treaty.

The administrative division of Dutch New Guinea, up till now, has been as follows:—

I.—Belonging to the residency of Amboina—
- (*a*) Western New Guinea (Fak Fak) assistant residency—from Tandjong Selee to Cape Steeboom (Polen Maurio), and surrounding islands.
- (*b*) Southern New Guinea (Merauke) assistant residency—from Cape Steeboom to the mouth of the Benschbach River, and surrounding islands. This was formerly a separate district, like Billiton; but by Royal decree in May, 1913, it was joined to Amboina.

II.—Belonging to the residency of Ternate—
- (*c*) Eastern New Guinea—the land extending from the estuary of the Benschbach River, on the south coast, up to the point where the Fly River crosses the 141 degree meridian.
- (*d*) Northern New Guinea (Manokwari) assistant residency—the country to the north of where the Fly River crosses the 141 degree meridian. Here, too, are the settlements of Hollandia and Sorong. A portion also of the Radja Ampat Island group (consisting of Waigecoe, Salawati, and Batanta), belongs to Northern New Guinea.

In the year 1891 the Government began to show a little more interest in New Guinea by including this possession in the steamer routes of the "Paketvaart" Company that had just then come into existence; and it was arranged that a steamer should call once every three months at Dore, Roon, Ansoes, Djamna, and Humboldt's Bay on the north coast, and at Sekar, Sekaroe, and Dobo, on the west and south coasts.

According to Melville, the portion originally taken possession of covered 3,210 square miles, with a population, roughly estimated, of 200,000 Papuas. As our present possession, however, extends over one-half of the island only, we may take it to cover 6,000 square miles.

Geelvinck Bay in the North, which is nearly 50 miles wide at the entrance, runs inland for about the same distance, cutting off a large peninsula, called Vogeltop, which is joined to the mainland by an isthmus 6 miles wide. The Gulg of MacCleur (formerly Vinck's Gulf, and named after Nicholas Vinck, the first discoverer in 1662), extends inland for 25 miles, dividing the peninsula of Vogeltop into two smaller ones.

The largest known river is the Amberano or Rochussen, which probably has its source in the Van Rees Mountains, and flows out into the large Geelvinck Bay. It can be navigated by deep-water vessels for a distance of 60 miles. The Jikali River takes its source from the high mountains west of Geelvinck Bay, and flows into the Gulf of MacCleur. The Fly River flows into Torres Strait east of the 140 degree meridian.

The climate of New Guinea is scarcely to be commended. On the north coast the temperature sometimes rises to 90 degrees Fahrenheit during the east monsoon, but alternate sea and land breezes give some relief.

The best known products are chiefly sago, ebony, ironwood, and copra. This last product of the millions of cocoanut-palms, as well as the extensive bird of paradise trade, was the cause of Merauke being brought under the "Customs."

As to how far the country is still exposed to danger from the natives may be gathered from a cable from Ambon on the 24th July last, stating that, on account of head-hunting expeditions being so rife, two military brigades, in command of a lieutenant-colonel, had been despatched thither.

On the 18th July last, news was cabled to the "Eoerabaiasch-Handelsblad" that Banda is to have a wireless station; and, as New Guinea has now been raised to the dignity of a separate residency, it is expected that Merauke, Fak Fak, and Manokwari, the seats of the Assistant Residents of South, West, and North New Guinea, and probably also the settlements of Hollandia and Sorong, the seats of the civil authorities, will share in that privilege.

Answers to Correspondents.

INCUBATOR PRIZE CHICKENS.

In reply to a correspondent who bought some clutches of incubated prize Orpington chickens, and found some of them to be deformed, with tails twisted sideways, and deformed backbones, Mr. J. Beard, Instructor in Poultry, Department of Agriculture, says:—" The cause of the deformity is by allowing the heat in the incubator to get too high during the last stages of incubation. The temperature should not be allowed to go higher than 103 degrees, and when cooling the eggs after the eighteenth day, probably not sufficient time was allowed for the process, which should be from 30 to 45 minutes, according to climatic conditions."

DISEASE IN TURKEY CHICKS.

In reply to Mr. P. Doonan, junr., Grandchester, Mr. J. Beard, Poultry Instructor, advises as follows:—"Wash the eyes, nostrils, and mouth thoroughly with a solution of boracic acid in warm water at the rate of 15 grains to the ounce. Clean the nostrils out by pressure with the finger and thumb, and the cleft in the mouth with a strong feather. This cleansing process should be repeated at least once a day, and in severe cases, where the discharge is very profuse, even oftener. Add a little kerosene to their drinking water. All affected birds should be quarantined."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1920.

Article.		February.
		Prices.
Arrowroot	ton	£60
Bacon	lb.	1s. 4d.
Barley	bush.	7s.
Bran	ton	£13
Broom Millet	"	£40 to £60
Broom Millet (Sydney)	"	£60 to £70
Butter (First Grade)	cwt.	176s.
Chaff, Lucerne	ton	£9 10s. to £14 10s.
Chaff, Mixed	"	£9 to £11 10s.
Chaff, Oaten	"	£10 to £13
Chaff, Wheaten	"	£5 to £11 15s.
Cheese	lb.	11d.
Flour	ton	£13 to £17 5s.
Hams	lb.	2s. 4d.
Hay, Lucerne	truss	£7 10s. to £8 10s.
Hay, Oaten	"	£15
Honey	lb.	6d. to 7½d.
Maize	bush.	8s. to 10s. 2d.
Oats	"	7s. 3d.
Onions	ton	£10 to £27 15s.
Peanuts	lb.	7d. to 10d.
Pollard	ton	£14
Potatoes	s. bag	£20 to £27 10s.
Potatoes (Sweet)	"	8s. to 12s.
Pumpkins (Cattle)	ton	£18 to £25 5s.
Eggs	doz.	1s. 6d. to 2s. 4d.
Fowls	per pair	4s. 6d. to 10s. 9d.
Ducks, English	"	4s. 9d. to 6s.
Ducks, Muscovy	"	7s. to 10s.
Geese	"	10s. 5d. to 11s.
Turkeys (Hens)	"	17s. to 19s.
Turkeys (Gobblers)	"	36s. to 48s.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	5s. to 6s. 9d.
Beans, per sugar-bag	3s to 12s.
Beetroot, per dozen bunches	9d. to 1s. 3d.
Cabbages, per dozen	3s. to 18s.
Carrots, per dozen bunches	1s. 6d. to 1s. 8d.
Cucumbers, per dozen	3d. to 2s. 6d.
Lettuce, per dozen	9d. to 1s. 9d.
Marrows, per dozen	6s. to 12s. 6d.
Parsnips, per dozen bundles	1s. 6d. to 2s. 6d.
Peas, per sugar-bag	10s. to 15s. 6d.
Potatoes (Sweet), per sugar-bag	8s. to 10s.
Pumpkins (table), per dozen	8s. to 10s. 6d.
Tomatoes, per quarter-case	2s. 6d. to 13s.
Turnips, per doz. bunches	3s. to 4s.
Turnips (Swede), per sugar bag	1s. 6d to 2s. 3d.

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY.
	Prices.
Bananas (Queensland), per double-case	...
Bananas (Tweed River), per double-case	7s. to 25s.
Lemons, per bushel-case	12s. to 25s.
Oranges, per bushel-case	20s.
Oranges (Navel), per bushel-case	20s. to 32s.
Passion Fruit, per bushel-case	5s. to 9s.
Pineapples (Queens), per double-case	10s. to 18s.
Pineapples (Ripleys), per double-case	12s. to 16s.
Pineapples (Common), per double-case	5s. to 10s.
Tomatoes, per quarter case	5s. to 8s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	6s. to 12s.
Apples, Cooking, per bushel-case	4s. to 12s.
Apricots, per quarter-case (Prime)	10s. to 12s. 6d.
Apricots, per quarter-case (Small)	4s. to 7s. 6d.
Bananas (Cavendish), per dozen	1s. to 4s.
Bananas (Sugar), per dozen	4d. to 6d.
Citrons, per cwt.	...
Cocoanuts, per sack	15s. to 25s.
Grapes, per lb.	2½d. to 5d.
Lemons (Lisbon), per half bushel-case	15s. to 30s.
Lemons (Rough), per cwt.	...
Limes, per half bushel-case	...
Mangoes, per case	1s. to 4s.
Nectarines, per quarter-case	3s. to 6s.
Oranges, per bushel-case	30s. to 35s.
Oranges (inferior), per quarter-case	2s. to 4s. 6d.
Papaw Apples, per quarter-case	1s. 6d. to 5s.
Passion Fruit, per half bushel-case	3s. to 8s.
Peaches, per quarter-case	2s. to 6s.
Pineapples (Rough), per dozen	3s. to 7s. 6d.
Pineapples (Smooth), per dozen	5s. to 7s. 6d.
Pineapples (Ripley), per case	5s. to 7s. 6d.
Plums, per quarter-case	6s. to 10s.
Rock melons, per dozen	...
Tomatoes (prime), per quarter-case	3s. 6d. to 10s.
Tomatoes (inferior), per quarter-case	5s. 6d. to 13s.
Water melons, per dozen	6s. to 18s.

TOP PRICES, ENOGGERA YARDS, JANUARY, 1920.

Animal.	JANUARY.
	Prices.
Bullocks	£25 10s. to £38 10s.
Cows	£22 to £24
Merino Wethers	79s.
Crossbred Wethers	72s.
Merino Ewes	72s.
Crossbred Ewes	63s. 6d.
Lambs	45s.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, 1920, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Re-cords.	Jan., 1920.	Jan., 1919.
North Coast.	In.		In.	In.
Atherton	12·87	18	12·90	4·10
Cairns	17·16	37	18·64	8·62
Cardwell	17·31	47	25·67	8·58
Cooktown	15·00	43	9·41	9·10
Herberton	9·93	32	11·84	6·27
Ingham	17·17	27	13·99	9·20
Innisfail	21·40	38	13·73	12·54
Mossman	19·85	11	16·22	10·09
Townsville	12·02	48	11·71	6·09
Central Coast.				
Ayr	12·44	32	15·90	6·68
Bowen	10·38	48	19·24	9·70
Charters Towers ...	5·86	37	7·75	1·16
Mackay	15·34	18	20·41	10·24
Proserpine	18·77	16	17·17	13·79
St. Lawrence ...	9·92	48	22·11	1·71
South Coast.				
Biggenden	5·62	20	7·03	0·58
Bundaberg	9·45	36	11·37	0·16
Brisbane	6·50	69	11·86	0·32
Childers	8·18	24	12·27	0·21
Crohamhurst ...	13·02	25	21·11	0·43
Esk	5·58	32	11·69	2·21
Gayndah	4·89	48	5·63	0·73
Gympie	6·74	49	16·67	0·44
Glasshouse M'tains	9·38	11	16·04	0·09
Kilkivan	5·80	40	10·79	0·76
Maryborough ...	7·46	48	12·35	0·49
South Coast— continued:	In.		In.	In.
Nambour	9·27	23	22·32	1·12
Nanango	4·64	37	6·70	0·18
Rockhampton ...	9·46	32	11·58	0·34
Woodford	7·40	32	15·50	0·20
Darling Downs.				
Dalby	3·33	49	6·49	0·71
Emu Vale	3·32	23	3·23	0·89
Jimbour	3·86	31	5·01	0·67
Miles	3·99	34	4·52	1·03
Stanthorpe ...	3·70	46	2·53	0·18
Toowoomba ...	5·06	47	6·74	0·48
Warwick	3·69	32	4·44	0·23
Maranoa.				
Roma	3·52	45	1·66	1·74
State Farms, &c.				
Bungeworgorai ...	2·62	5	2·68	0·49
Gatton College ...	4·48	20	5·47	1·13
Gindie	4·23	20	4·33	Nil
Hermitage ...	2·99	13	5·54	0·15
Kairi	9·49	5	9.46	4·76
Sugar Experiment Station, Mackay	17·24	22	21·87	10·29
Warren	8·53	5	7·26	0·44

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1919, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

LAW SOMNER'S

for FODDER CROPS.

A New Oat,

"Mortgage Lifter."

THIS variety was originally imported from America, and grown in South Australia, where results proved so satisfactory that the original grower preserved the seed from his first crop, and has grown it with every success during the past few seasons.

This New Oat grows to a height of 6 feet, and has yielded from 90 to 100 bushels to the acre. One grower reports very satisfactory results, obtaining 61 bushels in spite of a very dry season.

Graded, re-machined, clipped and tailed, **10/6** bushel; **9/6** bushel, in sack lots; **9/-** bushel in 5-sack lots.

Rape,

THE Food for Sheep.

RAPE is one of the most valuable Fodder Crops in cultivation. It is easily cultivated, makes strong, rapid growth, and produces an abundance of highly nutritious and palatable green feed, greatly relished by all kinds of farm stock.

GIANT KANGAROO RAPE (to arrive) will fatten three more sheep to the acre than any other variety. Exceedingly quick growth. **1/6** lb.; **150/-** cwt.

DWARF ESSEX RAPE. Best English Imported, **1/3** lb.; **112/-** cwt. New Zealand grown, **1/2** lb.; **102/8** cwt.

Sow **WHITE MUSTARD** with Rape; it prevents blowing; **2/-** lb.; **196/-** cwt., in ½-cwt. lots.

SPECIAL FODDER CIRCULARS are issued each season. They are invaluable to Farmers. A copy will be sent post free on request.

Lucerne,

The King of Fodder Crops.

LUCERNE will fatten Cattle, Sheep, Pigs, etc., better than any other feed and with less expense.

All our lucernes are specially machine-cleaned, hand-sieved, free from Dodder, and true to name, and have passed the Government test.

HUNTER RIVER LUCERNE.

Great scarcity of this splendid variety. Book your order NOW, as demand exceeds supply. **3/-** lb.; **320/-** cwt.

Sheep's Burnet

A MOST valuable Fodder Plant, thriving on the poorest chalk soils. A great drought-resistant; very suitable for dry countries where lucerne will not succeed. **1/6** lb.; **140/-** cwt., f.o.b., Melbourne.

Swedes and Turnips

Are excellent feed for Cattle, Horses, Sheep, and Pigs. Ready in the late Autumn, and, if pulled and stored, can be kept for a long time during the winter months when other feed is scarce. **5/-** lb.; **4/6** lb. in 7-lb. lots or more.

LAW SOMNER Pty. Ltd.

— *WHOLESALE AND RETAIL* —

SEED AND PLANT MERCHANTS,

HEADQUARTERS:

139-141 SWANSTON STREET, MELBOURNE, VICTORIA.

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will be ready for a first or second hilling up. The last of the maize will have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangols, and Swede turnips. Plant out paspalum roots. Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light, sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, pentstemons, &c. Sow annuals, as carnations, pansy, mignonette, dairy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruits, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systematic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry planting may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and, when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

SHORTHAND
26:6:26 System

Leading West Australian Newspaper investigates claims as to Ease, Speed, and Efficiency of this System.

(Reprint from *Western Mail* 30/10/19)

EARLY in September, a correspondent asked about the Bradshaw system of shorthand. As I do not know shorthand I made inquiries from the principals of two commercial schools, and neither recommended it.

Mr. G. S. Thompson, P.C.T., of Lombard Chambers, 61 St. George's Terrace, Perth, who is in charge of the Bradshaw System School of Shorthand in Perth, has called and pointed out that the opinions which were published in regard to the Bradshaw system were by men who teach the old system, and therefore they should not be taken against the many people who have learned the new and more simple system, and find it is thoroughly efficient. Mr. Thompson produced a number of letters, and gave references to many ex-students, some of whom had learned the Pitman system before and deliberately threw it aside in favor of the Bradshaw system.

He mentioned one journalist (a member of the "West Australian," who has since confirmed his statement), who learned the Pitman system and attained a speed of 140 words a minute. He then deliberately threw it over and took up the Bradshaw system. In six weeks he was using it in his daily work, and he now writes a legible shorthand note at the rate of 180 words per minute. Mr. Thompson says he himself taught Pitman shorthand for 30 years and used it as a journalist and as a certificated teacher, and is therefore qualified to express an opinion upon the relative merits of the two systems, one of which is 100 years old, while the other is modern, and the outlines of which contain the vowels, thus making for legibility.

He claims that it is not only immensely more simple, and can be learned much more quickly, but that it is more efficient than the old system. As I gave the opinions of the two rival teachers in all good faith, it is only fair that I should give equal prominence to Mr. Thompson's claims for the Bradshaw system, and to advise those who want shorthand quickly to thoroughly investigate its merits.

BRADSHAW'S 26:6:26 SHORTHAND is taught by post in 5 Easy Lessons.

Send 3d. for postage. Ask for Pamphlet No. P3 and specimen lesson, sent free without obligation on your part.

BRADSHAW'S BUSINESS COLLEGE
PTY. LTD.
246-50 Flinders St., MELBOURNE, VIC.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	January.		February.		March.		April.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·59	5 46
2	4·58	6·46	5·22	6·42	5·42	6·18	5·59	5·44
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·43
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·42
5	5·0	6·46	5 24	6·40	5·44	6·15	6·1	5·41
6	5·1	6·47	5·25	6·39	5·45	6·14	6·1	5·40
7	5 2	6·47	5·26	6·39	5·45	6·13	6 2	5·39
8	5 2	6·47	5·27	6·38	5·46	6·12	6·2	5·38
9	5·3	6·47	5·28	6·37	5·46	6·11	6·3	5·37
10	5 3	6·47	5·28	6·36	5·47	6·10	6 3	5·36
11	5·4	6·47	5 29	6·36	5·48	6·9	6·4	5·35
12	5·5	6·47	5·30	6 35	5·48	6·8	6·4	5·35
13	5·6	6·47	5·31	6 35	5·49	6·7	6·4	5·34
14	5·6	6·47	5·31	6·34	5·49	6·6	6·5	5·33
15	5·7	6·47	5 32	6·33	5·50	6·5	6·5	5 32
16	5·8	6·47	5 33	6·32	5·50	6·4	6·6	5 31
17	5·9	6·47	5·33	6·31	5 51	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·51	6 2	6·7	5·29
19	5·10	6·47	5 35	6·29	5 52	6·1	6 7	5·28
20	5·11	6·47	5·35	6 28	5·52	6 0	6 8	5·27
21	5·12	6·46	5·36	6 28	5·53	5 59	6 8	5·26
22	5·13	6·46	5 36	6·27	5·53	5·58	6·9	5·25
23	5·14	6·46	5·37	6·26	5 54	5·57	6·9	5 24
24	5·15	6·45	5 38	6·25	5·54	5 56	6·10	5·23
25	5·16	6·45	5·38	6·24	5·55	5·55	6·10	5·22
26	5·16	6·45	5·39	6·23	5·56	5·53	6·11	5·21
27	5·17	6 44	5·40	6 22	5 56	5·52	6·11	5·20
28	5 18	6·44	5·41	6 21	5 57	5·50	6·12	5·19
29	5·19	6·43	5 41	6·20	5·57	5·49	6 12	5·18
30	5·20	6·43	...	...	5·58	5·48	6·13	5·18
31	5·21	6·42	...	...	5·58	5·47	...	...

PHASES OF THE MOON.

The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical.

		H.	M.	
6 Jan.	○ Full Moon	7	5	a.m.
13 ,,	☽ Last Quarter	10	9	a.m.
21 ,,	● New Moon	3	27	p.m.
29 ,,	☾ First Quarter	1	38	a.m.

Perigee on 5th, Apogee on 17th. (An occultation of the planet Venus by the Moon will take place on the 17th. Unfortunately not visible in Australia.)

4 Feb.	○ Full Moon	6	42	p.m.
12 ,,	☽ Last Quarter	6	49	a.m.
20 ,,	● New Moon	7	35	a.m.
27 ,,	☾ First Quarter	9	50	a.m.

Perigee on 2nd and 28th, Apogee on 13th

5 Mar.	○ Full Moon	7	13	a.m.
13 ,,	☽ Last Quarter	3	57	a.m.
20 ,,	● New Moon	8	56	p.m.
27 ,,	☾ First Quarter	4	45	p.m.

Apogee on 12th, Perigee on 24th.

3 Apr.	○ Full Moon	8	55	p.m.
11 ,,	☽ Last Quarter	11	24	p.m.
19 ,,	● New Moon	7	43	a.m.
25 ,,	☾ First Quarter	11	28	p.m.

Apogee on 9th, Perigee on 21st.

There will be no eclipse of the Sun or Moon till May 3rd.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

ONION GROWING.

Although in April, 1919, we published an article on onion growing, we this year again deal with the subject, as many later selectors have taken up land during the year with a view to market gardening and also of producing some crops in a wholesale manner. Amongst such crops are onions, and now is the time for preparing for the crop.

There is no reason why onions should be imported in such quantities as we see daily arriving by steamer from the Southern States. The climate here is perfectly adapted to them, and, if only planted on suitable soil and given the necessary attention, heavy crops are an almost certain result. At one time it used to be said that onions could not be profitably grown as a field crop in the Blenheim district, near Laidley. To disprove this, the writer determined to experiment on the sandy loam of the scrub land on Sandy Creek. The seed was sown in April; the variety, Brown Spanish. The land to which they were to be transplanted was well worked and then rolled to make a hard, compact bed. Transplanting was carried on throughout July, and the season having proved favourable the result was a heavy crop of magnificent bulbs, which gave a splendid return for the labour expended. Now, if such a result can be obtained by one farmer, it follows that others can do the same. As there are thousands of acres of similar land under cultivation both there and in many other portions of the State, it only requires determination on the part of the farmers to enable them to successfully displace the importations from the South.

On looking over an old diary of farm operations, it appears that the writer's crops averaged 6 tons per acre, and sold at £25 per ton. Are there many crops which will give a like return? The present price of onions in the market is about £17 per ton. Now, suppose a crop to yield 8 tons per acre (and we know that double that return has been made), the cash return for a medium crop will amount to £136. Certainly there is a considerable amount of labour involved in planting out an acre or two of onions, but that labour is amply compensated for by the net returns.

A consideration of the following notes, based on practical experience, may, therefore, be of some service. Let us first consider

THE SOIL.

The most suitable soil for onions is a rich sandy loam, such as that of the Blenheim scrubs—free, friable, and easy to work, a soil that will not cake, and not lying so low as to retain the superabundant moisture after heavy rains. In such a case the land should be well drained. An eastern or south-eastern aspect has been proved to be better than if the land sloped to the west, as the onion does not require intense heat to bring it to perfection.

Before sowing the seed, it is important that the seed beds should be clear of weeds and of their fallen seeds. By sowing in April or May, there is not much to fear from weeds; still, it is advisable that the land, both of the seedbeds and of the area proposed to be planted out, should be turned up and exposed to the weather for some time previous to sowing. As soon as the weeds appear, give the land a good scuffling, and if this be done two or three times between March and April there will be no trouble afterwards. If the soil be not virgin scrub, or if it has borne crops for many years in succession without manuring, it should be thoroughly well manured with stable dung, ashes, bonedust, &c., as the onion demands plenty and the best of nourishment. New scrub land is rich enough in natural fertilisers not to require any addition of manure.

PREPARING THE SOIL.

In planting out onions a very serious mistake is often made, and that is, the soil is carefully worked, reduced to a fine tilth, and the plants are set out in a soil which is loosened to a depth of perhaps 8 inches. From land prepared in this manner no good results need be expected. The onion requires a firm bed; otherwise the plant, instead of making a large well-shaped bulb, will run to neck, and have more the appearance of a leek than of an onion. Therefore, the land before being planted must be well solidified by rolling.

THE SEEDBED.

Onions may be sown broadcast, or they may be drilled in, or they may be sown in a seedbed and afterwards planted out in the same manner as cabbages. The best way is to drill them in. In this case, about 2 lb. of seed per acre will be required. The seeds must be dropped at a distance of about 2 inches apart in the drill, and the drills should be from 12 inches to 15 inches distant from each other. The plants will afterwards require thinning out with the hoe. When sown in a seedbed, planting out must be resorted to—a tedious process, but one that pays well for doing well.

On rich soil the plants may be 6 inches apart. The drills should be slightly raised, and the roots of the plant firmly embedded in it—allow the bulb to, as it were, squat on, not under the surface. As the plant grows, the soil must be kept perfectly clear of weeds, and, where the working of the ground has thrown the soil against the bulbs, it must be drawn down, so that only the root is in the ground. Where this has not been attended to, the remedy for the resulting want of bulb formation is to wring the necks of the plants, or, at least, to bend them down with a twist. This will have the effect of inducing the formation of bulbs.

When sowing the seed, care should be taken that they are not covered to more than their own depth. If sown deep, many seeds fail to germinate, and most of those that do appear will make an abnormal growth of neck, causing much labour in drawing away the soil from the incipient bulbs. The writer has never sown onions broadcast, and therefore offers no opinion on the value of the method. Of course more seed would be required per acre, and, if weeds are troublesome, a good deal of hand work would be necessary.

Now, about the seed. There are few seeds so annoyingly deceptive as onion seed. So difficult was it to get good seed in the State even at 10s. per lb. in the good old days, that growers imported it from Spain. The largest growers at Oxley, Messrs. Martindale and Nosworthy, were most successful with imported seed, but the writer had a very bad experience in this business. Twenty pounds weight of onion seed was sent from a friend in Germany. Instead of packing it in hermetically sealed bottles, he stowed it in calico bags in the body of an immense wooden Swiss cuckoo clock. When the clock was opened the bags of seed were examined, and looked perfect in colour and shape; but, alas! when subjected to pressure, no oily fatness was perceived; and when at last it was given a chance and sown thickly in drills, five acres returned the magnificent yield of 72 lb., which, at the rate of £28 per ton, amounted to 18s. Certainly, the land, after a week's waiting for the seed to germinate, was utilised otherwise, but not 1 cwt. of onions was harvested.

Make sure, therefore, of the seed. After sowing, it should germinate in less than a week.

In former days large onions were always aimed at, but now the public taste is in favour of medium-sized bulbs, so that closer planting may be adopted.

Onions may be known to be ripe by the drying up of the tops. As soon as this happens, take them up by hand and leave them on the ground between the rows to dry. As soon as they are dry, carry them carefully with as little bruising as possible to the barn.

As before stated, the Brown Spanish has proved most successful in this State. but the gentlemen above mentioned grew what they called the large White Portugal onion. It certainly was a splendid bulb, and fetched very high prices in the markets of Brisbane, Maryborough, and Rockhampton.

COST OF WHEAT PRODUCTION IN NEW ZEALAND.

The theory that wheatgrowing in New Zealand at the Government average price of 6s. 8d. a bushel is not a profitable proposition is demonstrated by an analysis of the cost of production, says the agricultural editor of the Christchurch "Weekly Press." He submits figures to prove this. They relate to 1 acre, and are based on fair contract prices for such work, which may be taken to cover interest, depreciation, and repairs on implements. It may be assumed that wheatgrowing land in Canterbury, capable of growing 27 bushels to the acre, which is the Canterbury average over a number of years, is worth £30 an acre. The cost of ploughing is set down at an average between lea land and stubble, and on these bases the cost can be claimed to work out as follows:—

	£	s.	d.
Interest on £30 at 6 per cent	1	16	0
Ploughing	0	12	6
Seed (1 2-3 bushels at 6s. 10d.)	0	11	5
Manure (1 cwt.)	0	9	0
Threshing (27 bushels at 1s.)	1	7	0
Cultivating (two strokes) 7s., harrowing (two strokes) 2s. 6d., drilling 3s., pickling seed 6d., harrowing after drilling 1s. 3d., rolling 3s., reaping 7s., twine (5 lb. at 8d.) 3s. 4d., stooking 2s. 3d., other labour 5s., loss on sacks 2s., seaming twine 4d., carting to railway 7s.	2	4	2
	£7	0	1
Value of crop (27 bushels at 6s. 8d.)	9	0	0
Profit on 1 acre	£1	19	11

The farmer that sows 50 acres of wheat has something less than £100 out of which to pay rates, taxation, keep his fences and ditches in repair, and generally provide for the evening of life. In addition, a value has to be attached to the severance of a farm, unproductive portions occupied by buildings, and occasional roadways and quite a number of small out-goings known to the tiller of the soil. Then the exhausting character of the crop has to be considered, and its dependability on seasons. But, above all, the payability of wheat production does not compare with other branches of farm activity. How would dairymen, who can run a cow to the acre, and return from £20 to £25 annually, like to accept £1 19s. 11d.?

BREEDERS OF PUREBRED STOCK.

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
		AYRSHIRES.		
W. C. Smith	"The Haven," Goomeri	1	7	Ayrshire Society of Queensland.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1920.

Another very unfavourable month for egg production has been experienced. For days at a time the thermometer has registered in the proximity of 100 degrees. No rain fell during the month, but greenstuff has been procurable. R. Burns's D. bird laid 26 eggs for the month, bringing her total to 307 eggs. The 300th egg was laid on the 21st of the month. R. Holmes's E. bird laid 24 for the month, making her total 298. A Kelving Poultry Farm's Plymouth Rock laid 22 for the month, her total for the eleven months being 278. A Chinese Langshan, owned by J. Ferguson, has laid 250 eggs for the eleven months. The leading Leghorn has laid 272, and is owned by B. Caswell. Two deaths occurred during February, the cause in both cases being ovarian troubles. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
	LIGHT BREEDS.		
*T. Fanning	White Leghorns	124	1.489
*J. M. Manson	Do.	117	1.476
*E. A. Smith	Do.	118	1,408
*W. Hindes	Do.	95	1,373
*Dr. E. C. Jennings	Do.	90	1,320
*G. W. Hindes	Do.	106	1,294
*W. Becker	Do.	115	1,281
*Dixie Egg Plant	Do.	69	1,266
*Range Poultry Farm	Do	90	1,262
*Haden Poultry Farm	Do.	96	1.259
*Quinn's Post Poultry Farm	Do.	88	1,254
*B. Caswell	Do.	87	1,248
*C. P. Buchanan	Do.	81	1,215
*H. Fraser	Do.	92	1,212
J. H. Jones (Toowoomba)	Do.	72	1,199
S. McPherson	Do.	82	1,191
*L. G. Innes	Do.	74	1,180
W. A. Wilson	Do.	93	1,176
*W. Lyell	Do.	90	1,171
*Mrs. L. F. Anderson	Do.	86	1,162
*J. J. Davies	Do.	84	1,157
*Mrs. A. G. Kurth	Do.	85	1,150
*Thos. Taylor	Do.	107	1,150
S. W. Rooney	Do.	107	1,128
Geo. J. Byrnes	Do.	91	1,128
G. Williams	Do.	52	1,096
Mrs. N. Charteris	Do.	100	1,088
*Mrs. R. Hunter	Do.	71	1,066
Geo. Trapp	Do.	78	1,063
H. A. Jones (Orallo)	Do.	62	1,043
*O. W. J. Whitman	Do.	73	1,041
N. A. Singer	Do.	104	1,039
C. A. Goos	Do.	75	1,021
B. Chester	Do.	66	1,016
H. O. Jones (Blackstone)	Do.	89	1,002
Oakleigh Poultry Farm	Do.	81	995
G. H. Kettle	Do.	56	989
J. W. Newton	Do.	59	972
R. C. J. Turner	Do.	72	949
J. H. Dunbar	Anconas	74	899
W. Morrissey	White Leghorns	71	887

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
	HEAVY BREEDS.		
*R. Holmes	Black Orpingtons	114	1,492
*E. F. Dennis	Do.	119	1,448
*R. Burns	Do.	103	1,418
*E. M. Larsen	Do.	83	1,337
*A. E. Walters	Do.	100	1,302
*W. Smith	Do.	67	1,297
*E. Morris	Do.	102	1.237
*Kelvin Poultry Farm	Plymouth Rocks	91	1,214
Geo. Nutt	Black Orpingtons	75	1.202
*Mars Poultry Farm	Do.	106	1,184
*T. Hindley	Do.	86	1.176
*Nobby Poultry Farm	Do.	69	1.164
R. B. Sparrow	Do.	104	1.148
*A. Shanks	Do.	62	1,140
*Jas. Ferguson	Chinese Langshans	95	1,133
*D. Fulton	Black Orpingtons	81	1,086
*W. H. Reilly	Chinese Langshans	87	1,061
A. Homan	Black Orpingtons	89	1,060
Burleigh Pens	Do.	82	1,057
*F. W. Leney	Do.	66	1,0 3
J. A. Cornwell	Do.	86	999
C. H. Singer	Do.	75	955
*H. Puff	Rhode Island Reds	61	953
H. Ashworth	Black Orpingtons	74	919
A. Gaydon	Do.	75	911
*T. B. Barber	Do.	71	905
Total	...	5.756	77.116

* indicates that the pen engaged in single hen competition.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B	C.	D.	E.	F.	Total.
			LIGHT BREEDS.				
T. Fanning	246	232	244	263	245	259	1,489
J. M. Manson	253	232	261	256	222	252	1,476
E. A. Smith	235	227	250	232	220	244	1,408
W. Hindes	240	240	237	207	217	232	1,373
Dr. E. C. Jennings	227	202	217	213	205	256	1,320
G. W. Hindes	225	220	235	210	195	199	1,294
W. Becker	245	224	234	205	174	199	1,281
Dixie Egg Plant	193	214	225	202	206	226	1,266
Range Poultry Farm	199	219	229	224	188	203	1,262
Haden Poultry Farm	238	225	215	204	165	212	1,259
Quinn's Post Poultry Farm	199	202	211	249	193	200	1,254
B. Caswell	174	158	201	237	272	206	1,248
C. P. Buchanan	173	237	175	204	202	224	1,215
H. Fraser	163	231	235	210	152	221	1,212
L. G. Innes	149	231	165	210	229	196	1,180
W. Lyell	185	214	220	184	192	176	1,171
Mrs. L. F. Anderson	216	224	185	201	156	180	1,162
J. J. Davies	195	203	203	177	184	195	1,157
Mrs. A. G. Kurth	237	207	205	187	152	162	1,150
Thos. Taylor	197	157	179	217	223	177	1,150
Mrs. R. Hunter	178	121	201	173	194	199	1,066
O. W J. Whitman	168	206	153	154	187	173	1.041

GRIT, SHELL, AND BONE FOR MUSCOVY DUCKS.

BY R. T. G. CAREY (Muscovy Breeder), Beerwah.

All classes of fowls masticate their food by a grinding process in the gizzard. The gizzard is lined with a tough membrane, or rubber-like callous skin, of a corrugated shape; one portion is even harder than the thinner parts, in consequence of the pressure caused by the process of milling, although the gizzard is immune to injury by hard, flinty, or any other sharp material which may be eaten by the bird. The harder and more insoluble that material, the longer is grinding prolonged. Hence, bits or pieces of broken delf, glass, sharp flint, or granite grit will not cause any harmful effects, but are all suitable ingredients, and should be kept before the ducks continually. In fact, it is indispensable for birds of all ages, figuratively speaking, from egg to egg. There is no fear of their eating too much grit, their judgment in that respect being carefully gauged. You have by glancing into the grit vessels which would show depletion a guide to the amount required, and how often fresh supplies are needed.

Muscovy Ducks require a smaller size, even finer, than for poultry. I do not intend to discuss the precise mechanical office of grit; nevertheless, if ducks were to consume grit for the sake of supplying millstones or grinding pebbles, they would soon overdo it, but when the usefulness of grit becomes exhausted it is cast out for sharper and more cutting ones. As an examination of a gizzard reveals, many have become quite round or oval from continuous slow movement, while in that organ the average healthy Muscovy duck deposits enough grit in a week to last it for a year for all purposes if it were not for its wearing. The grit is ground down to round particles by the continual motion, muscular contraction, and dilation of the gizzard, combined with the cutting of fibrous and fleshy materials to a pulp, and moistened by the juices of the herbs and any other factor that may contribute to the pulverising of their foods. Hence the essential requisition of grit as part and parcel of the Muscovy's *ménu.*

Shell, an organic and calcareous substance composed chiefly of lime, is also an essential and a necessity, and must be supplied in some form, chiefly by oyster, mussel, and other sea-shells, lime-rock, from some insects, even old mortar, or old plaster. With such a superabundance of lime-supplying material for our disposal and use, it ought never to be inadequately supplied or withheld from Muscovy ducks. Yet how neglectful and forgetful are owners of those beautiful, massive, webbed-footed fowls in withholding shell grit, that much-needed article. "*It is the secret of success.*" Lime, no matter by what channel it is administered (as slack or kiln lime, for example), is to the young ducklings as mortar is to the bricklayer. What sort of a house could a mason build from rubble-stone without mortar (water, lime, and sand) to hold the bricks or stones together, and also to withstand the elements and tempest? Similarly with the rearing of young Muscovy ducklings. Why, you cannot get those great frames built which form the birds' structure, which are filled up with delicious flesh, if those essentials in forming the bony construction are withheld. The failure to supply those essentials acts detrimentally on the industry, in that your ducks are lacking in size, and soft-shell eggs or shelless eggs result.

Lime is not, in a sense, to be termed a duck food, as it does not in any way sustain life, but for egg-production it plays an important part and for the help it gives in bone-forming. Animals' bones ground to small particles aid and contribute a very valuable asset to the rearing of the young Muscovy ducklings; however, do not feed it too heavily. It is usually mixed into and given with the morning mash. In fact, it is best to reduce the bone and the shell grits to a powdery state, and give the ducks portion of it every alternate day.

In conclusion, let me remind you that no single formula can be used for best results during the entire year, as the proportions harmonise with the seasons, like the laying season. The consumption of lime is greater than during the moulting season. It will also be seen that, in rearing ducklings, the consumption is greater than in the case of the adult. Therefore, be guided and governed by observation of your empty grit, shell, and bone boxes.

BOT-FLY REMEDY.

According to Professor Cook, Stockholm tar, if placed on the nose and inside the nostrils, will prevent the bot-fly from depositing her eggs or larvæ in the nose of the sheep. Place Stockholm tar in the bottom of a trough to the depth of 1 inch, and cover with salt. In this way the tar gets on the nose and into the nostrils while the sheep is gathering the salt.

Dairying.

MAKING BUTTER FOR CONSUMPTION WITHIN THE HOME.

In the parts of this State where dairying is in general practice, it has become the custom to forward the cream raised on the farm to a butter factory, where the cream is received, treated, and manufactured into butter. To those supplying cream in this way to the factory, the process of manufacture of small quantities of butter on the farm is generally well understood. However, there is a number of persons scattered throughout the State who milk one or more cows, and have neither the desire nor the opportunity to tender the cream from the milk to a butter factory, but on the other hand, they are anxious to make butter from the cream. Frequently, advice upon the procedure to be followed in so doing is sought from this office, and it is with the object of meeting inquiries of this nature that the subsequent simple particulars are supplied relative to the production of milk and cream, and the manufacture of the latter product into butter. The more important matters for observation will be referred to in their natural sequence.

Primarily it must be understood that the flavour of butter is influenced by—(*a*) the class of food to which the cows have access, (*b*) the degree of cleanliness practised in the handling of the milk and cream, and the skill exercised in the manufacture of the butter.

Many varieties of weeds and some useful fodders are capable of conveying objectionable flavours or taints to milk, and, in turn, the tainted flavour is noticeable in the cream, and ultimately the flavour of the butter is affected.

The tainting influence of fodders is minimised by feeding same to cows directly after milking, but not immediately preceding same.

Thorough cleanliness is necessary to prevent contamination of the milk or cream. The cow-bail and place where the cow is milked must have an impervious floor, and be kept in a clean and sweet condition. The udder, teats, and flanks of the cow should be washed and wiped prior to milking. The hands of the person who intends to carry out the milking should be cleansed similarly.

The milk should never be exposed to an impure atmosphere.

Strain the milk without delay after it is drawn from the cow by running it through a very fine-mesh gauze or, preferably, through a strainer fitted with a wad of sterilised cotton.

The milk should next be passed through a separator, or set in dishes to allow it to cream, the separator proving by far the more satisfactory means of obtaining the cream. If setting of the milk in dishes has to be restorted to, it will be found that shallow dishes, which provide a comparatively large surface for the cream to gather upon, are more satisfactory than deeper vessels with a limited surface.

Generally the milk is allowed to sour, or even coagulate before the cream is skimmed off, but no more cream can possibly rise to the surface after the milk has thickened. The layer of cream is removed with the aid of a utensil termed a "skimmer," the customary makeshift being a tablespoon. The objective should be to collect as much cream as possible, but to avoid gathering any of the milk with it.

The cream is best placed in an enamel vessel and should be kept as cool as possible. It must not be brought into contact with a tainted atmosphere, for the cream readily absorbs odours from such a source.

It is advisable not to mix the cream obtained by individual skimmings, or separations of the milk, until some hours before churning time, when the whole of the cream available for churning should be placed in one receptacle, and allowed to ripen uniformly. Always avoid the mixing together of hot and cool cream.

A certain amount of lactic acid should be permitted to develop on the cream before churning, and this usually requires from thirty-six to forty-eight hours, according to the care taken and the temperature at which the milk and cream are held. Holding either milk or cream at comparatively high temperatures expedites the development of the acidity.

Generally natural temperatures in Queensland, particularly during the warmer season of the year, are too high to give satisfactory results in the churning of cream, and to remedy this difficulty, artificial cooling of the cream by the aid of an ice-chest is advantageous. The water used for butter-washing purposes may be placed in a vessel and similarly cooled in the ice-chest. A more primitive means of cooling the cream is to stand the vessel containing it in water drawn from an underground well or spring; another method is to make a canvas jacket to cover the vessel holding the cream, and to arrange that the edges of the canvas covering reach a supply of water, which is drawn up by capillary attraction, and acts on the same principle as the cooling of water in a water-bag.

Usually good results in churning are obtainable by having the cream at a temperature of 56 degrees to 58 degrees Fahr. during the cooler months of the year, and reducing the temperature of the cream preparatory to churning several degrees lower throughout the warmer season.

In butter-making there are certain requisites and appliances that must be provided, even in cases where primitive methods are practised. Firstly, an ample supply of both hot and cold water must be available. The cold water is necessary for the purpose of washing the butter, and the hot water is required for use in cleansing and scalding the dairy utensils.

The water may be drawn from either a tank or well supply, provided it is wholesome. What is known as "hard" water from a well supply may be employed for washing the butter, so long as this condition of the water is caused by the presence of salt or limited percentages of other mineral matter, not injurious to health. Water containing decayed vegetable matter should not be used for washing butter.

To recover the cream from the milk, either milk setting-pans or a separator is required. The setting of milk in pans to allow the cream to rise is not to be viewed as a satisfactory or economical method of recovering cream from milk. In the first place, there is the risk that the surface of the milk will catch a deal of fine dust particles from the atmosphere while awaiting for the cream to rise; another disadvantage is, that a large percentage of the butter-fat content of the milk is not recoverable by this method. A small-sized separator provides by far the more advantageous means of recovering the butter-fat from milk. Separators of a wide range in skimming capacity are procurable, and one should be secured of a capacity in agreement with the complement of milk to be treated.

A churn is necessary. There are many types of churns that have been designed to meet the requirements of those who desire to churn, for their own use, small quantities of cream. Generally, all are capable of churning satisfactorily. For convenience, the churn should be simple in construction, durable, and so designed as to be readily cleansed.

Two butter pats for use in working and salting the butter should be provided.

Hand power butter-workers are procurable on the market, but such appliances (while admittedly most serviceable) are more suited to cases wherein the operations of the butter-maker are carried on in a comparatively large scale. In instances where it is intended to manufacture sufficient butter to satisfy the requirements of a family, the two pats are to be made to perform successfully the working and patting of the butter. This process can be carried out in a clean shallow dish if so desired.

A dairy thermometer is a most useful article, and should be included in the equipment of the dairy; and by its aid the temperatures of cream or water may be determined from time to time.

Churning is simply a mechanical process for bringing together the butter-fat globules in the cream in order to make them coalesce or unite. Preparatory to the churning of cream, the utensils used in connection with the process should be dipped in scalding water and then rinsed in clean cold water.

The whole of the cream from the various skimmings or separations of the milk (that should have been cooled and mixed in a container for some hours prior to churning time) is placed in the churn and the churn is put into operation.

If the churn is of a design that allows the operator to view the cream while churning, it will be noticed that, after some little time under the churning process, the cream will assume a paste-like consistency and possess a smooth texture. At a later stage the cream will appear to increase in density, and subsequently the texture will appear gritty. This gritty appearance of the texture of the cream is occasioned by the unison of the fat globules, and indicates that the churning is nearing completion. Care should be taken at this stage that no cream is allowed to remain stationary on the sides of the churn, and any cream attached thereto should be removed and brought under the influence of the "paddles" of the churn with the main bulk of the cream. Otherwise a portion of the cream will remain unchurned, and be carried away and lost with the butter-milk.

As soon as the cream "breaks," it is advisable to add a small quantity of cold water to flush the sides and paddles of the churn, using about half a pint of water to each quart of cream in the churn. Carry on with the churning process until the globules gather in particles about the size of a grain of wheat. Now stop the churning and allow the butter to float upon the butter-milk, which should then be drawn off. In the case where the temperature of the cream is higher than it should be for correct churning, the butter-fat fails to assume a granular appearance, but gathers rather in the form of a mass of soft fat. However, this does not call for any change in the procedure in so far as the draining off of the butter-milk is concerned. When this is done, add wash water to the churn, and wash the butter, working the butter with the pats in order to eliminate the butter-milk as thoroughly as posssible. The temperature of the wash water should be several degrees below that specified for the cream. It is well to remember that the incorporation of an excessive amount of butter-milk in the butter will result in the keeping properties of the latter being prejudicially affected.

In some cases a second washing of the butter is advantageous, but this is dependent upon the degree of success attained in removing the butter-milk in the first washing. After the washing of the butter has been effected, add fine salt to the butter in the proportion of half an ounce of salt to each pound of butter.

Work the butter steadily with the pats, taking care not to injure the grain of the butter more than is necessary in expelling the excess of moisture. The working also mixes and incorporates the added salt with the butter.

If the churning of the cream has been carried out efficiently and correct temperatures observed and the butter properly washed, the moisture showing in beads on the finished article will be in the form of a crystal clear brine.

The butter is now ready for use, but as it is capable of absorbing odours given off by other strong flavoured foodstuffs, it should be stored away beyond attack from such influences in clean surroundings and kept as cool as possible.

THE EFFECT OF SOILING ON BREED: HOW IT PREVENTS REVERSION TO TYPE.

The advantages to the dairy farmer of the soiling system—that under which a succession of fodder crops is grown and carted out to the animals in the field or barn—are many and substantial. The following paragraphs are from the pen of a recent writer on the subject:—

"The influence of soiling on breed is enormous. After all, it is the soiling system—carried on through the greater portion of each year during the centuries—that has built up the great breeds. Take, for instance, the most famous of all the butter breeds—the Jerseys and Guernseys. The soiling system has made them what they are, and maintains them at their present high pitch of excellence. For centuries the Channel Island farmers have soiled their cows. The land is far too expensive to farm in any other way. As in the Channel Islands, so also on the English and Danish stud farms. Where the great milking breeds have been built up, soiling has been and is carried on to an enormous extent. The breeds could never have been built up without it.

"It must be remembered that the dairy cow as we know her to-day is not one of nature's productions, but one of man's. Nature's only concern is that a cow should produce enough milk to nourish one or two calves. If man wants anything better than this he must develop it himself. Man has wanted more, and has developed more by careful judging and selection. But the moment that careful selection and regular full feeding cease, a steady but certain reversion to type begins to take place. The animal in herself and her descendants slowly go back to a state of nature. The high development of the milking function can only be kept in that condition by persistent effort.

"FEED THE GREAT FORCE.

"On every poor grazing farm throughout New Zealand this down-grade process of reversion to type is going on to a greater or less extent. A farmer pays out a stiff sum of money for some really good stock, and full of hope brings them on to his farm. Just at first the results justify expectations; but as years go by the farmer is sadly disappointed. He selects carefully year by year, yet still the results are not what he had hoped for. Now, why is it? It is simply that the great force that built up those good cows is being slackened. Feed was the great force, and the cows now don't get, either in quantity or quality, what their forbears got. They have to roam over large areas of indifferent pastures for a living. They are being compelled to live very much according to the conditions under which their very remote forbears lived, as wild cattle. The farmer has done his best to select, and this is a tremendous aid to the great force of feeding. But he may select until he is black in the face; he will not stop the down-grade movement in his herd if he neglects the primary factor in the development and maintenance of breed—full feeding.

"BREEDING GONE TO WASTE.

"In New Zealand there has been an enormous amount of money wasted owing to this reversion to type. Thousands of pounds have been spent in importing pure-bred stock from other countries. They have been turned out to forage for a living like a common cow, and have consequently run steadily down. This sort of thing is going on to a greater extent now than fifteen years ago, simply because many of the dairying lands are not as good now as they were then. You can't go on dragging out of the soil the valuable constituents that milk is composed of, year after year, and sending them away in the form of butter and cheese and bacon, without weakening it enormously and making it less and less capable of supporting cow life profitably.

"As a matter of fact, a pure-bred cow will not do as well as a mongrel very often, if she is placed under the conditions (as she generally is) to which the mongrel is accustomed. But a pure-bred cow under the soiling system will give better results (all things being equal) than the mongrel, because the pure-bred is then being kept under the conditions which she and her progenitors were accustomed to."—"Farmer and Grazier."

A CLEAN MILK SUPPLY.

By R. B. TENNENT (N.D.D.)

The rapid advance in the study of bacteriology during recent years has served to demonstrate more than ever the danger of supplying unclean milk to the general public. The problem of providing an adequate quantity of good pure milk at a reasonable price has for many years occupied the attention of our Public Health authorities, who fully recognise its vital importance from a public health point of view, but, unfortunately, their efforts have not so far proved successful in securing for the consumer milk certified free from harmful bacterial contamination.

In Australia we have laws ensuring that the "quality" of milk shall be of a certain standard, prohibiting adulteration either by the addition of water or removal of butter-fat, and one has only to note the frequent prosecutions of unscrupulous vendors to realise that such laws are necessary and efficacious. Although important, this aspect of the question will not be dealt with here, attention being directed to the even more important subject of supplying a really clean and wholesome milk for general consumption.

In view of the fact that we hear so much concerning the national necessity for preserving infant life, and that various "Child Welfare Centres" have been established to attain that laudable object, this is an opportune time for a general review of the whole question, and a consideration of the more important results arrived at by recent investigators. Obviously, it is impossible, in an article of this length, to deal fully with the various problems pertaining to the subject, stress being chiefly laid on its serious nature and the urgent necessity of obtaining proper and efficient control of the country's milk supply.

MILK-BORNE DISEASES.

At the present time, a great deal of loose talk is heard about the dangers of milk, and although often exaggerated and emanating from the ill-informed, such talk contains a certain amount of truth. There can be no question that milk, so widely consumed and so readily contaminated, may be a vehicle for the transmission of infectious diseases to man. The infectious diseases which have been shown to have been spread by milk are as follows:—

Diphtheria.
Scarlet fever.
Malta fever.
Dysentery.
Typhoid fever.
Infective sore throats.
Gastro-enteritis.
Cholera.

That tuberculosis may be conveyed to human beings by the consumption of milk has more recently been proved, and the chief sources of infection can be conveniently grouped under three headings.

A. Direct human infection.
B. Indirect human infection.
C. Bovine infection.

DIRECT HUMAN INFECTION.

Where a person who comes into direct contact with the milk is suffering from some form of disease, whether acute or latent, the possibilities are that some of the germs of that disease will enter the milk. In the case of "carriers," *i.e.*, persons not actively suffering from the disease, yet carrying the germs of it, it will be a difficult matter to ascertain the source of infection.

INDIRECT HUMAN INFECTION.

The infection may originate from water polluted by the excreta of human beings. Utensils washed with such water would prove a source of contamination.

BOVINE INFECTION.

Contamination may originate in this instance from an animal which is suffering from a disease such as tuberculosis.

The first source of infection is largely responsible for the outbreak of many epidemics, yet, from the dairy farmers' point of view, the third source—bovine infection—is probably of more interest. It is hardly necessary to deal with all the diseases to which the cow is heir and which may be transmitted to man, for excluding tuberculosis, it is generally admitted that the great majority of bovine teat and udder lesions are not a source of danger to man. To the reader seeking a careful review on this subject Savage's "Milk and the Public Health," is confidently recommended; also an important report on "Milk and its Hygienic Relations" (Lane-Claypon, 1916), published under the direction of the Medical Research Committee.

Tuberculosis is by far the most important disease of cows, chiefly on account of its wide prevalence, the frequency with which the bacilli of the disease gain access to milk, and because the disease can, in this way, be transmitted to man through the milk.

It has been proved beyond question that milk may contain the bovine tubercle bacilli, and this being so, it is at once evident that children fed largely on a milk diet are more likely to become infected than the much less susceptible adult, whose powers of resistance are naturally stronger. The presence of the tubercle bacilli in the milk is most commonly due to the udder or teats containing tubercle lesions, but many cases of milk being infected with these organisms have been recorded where no apparent tubercle lesions could be found, either on the teats or the udder. In such cases the cause of infection would, in all probability, be from some other source, such as contamination from manure, &c.

On account of the widespread prevalence of tuberculosis among cattle in Australia, we are faced with a serious problem in attempting to effectively control this disease. Many schemes have been suggested and discarded, such as the compulsory inoculation of every animal, the segregation of the affected, and so forth, but, so far no finality on this point has been attained; therefore it is obvious that until this problem has been successfully dealt with, it will be practically impossible to obtain milk free from the suspicion of infection. One tuberculosis cow in a herd will infect the whole milk supply if she secretes milk containing the tubercle bacilli.

A few facts and figures on this point will prove of interest. The extent to which tuberculosis is prevalent in cows can only be estimated by the use of the tuberculin test. Hunting examined 4,000 English cattle and found 20 per cent. tuberculous. In Massachusetts, U.S.A., during 1897, 58.5 per cent. of the cases reacted; in Saxony, 35 per cent. were tuberculous; in Norway, 8.4; in Belgium, 60; in Sweden, 42; and Denmark, 31. It is noted that the older the animal the higher the percentage. Thus, of 14,684 cows over four years, slaughtered in Berlin 14,556, or 99 per cent., were tuberculous. The lesions, of course, were in some cases trifling, but as the examination was a macroscopic one, the application of the tuberculin test would probably have produced even higher results.

The Medical Officer of Health of the London County Council, during the period from 1907 to December 1913, examined for the presence of tubercle bacilli 13,321 samples of milk forwarded from places outside the county. Of these, 1,323 samples, or 9.9 per cent., were found to contain tubercle bacilli, as shown by the inoculation of guinea pigs. During the year 1913, 9.3 per cent. of the samples examined were found to contain the tubercle bacilli.

In Edinburgh, Mitchell examined 406 samples between November, 1913, and May, 1914, all taken from shops selling milk, with the result that 82, or 20 per cent., were found to be capable of producing tuberculosis when inoculated into guinea pigs.

Delépine examined 7,681 samples of milk from Manchester between the years 1897 and 1913, and found that 8.7 per cent. contained tubercle bacilli. In consequence, 276 farms were inspected, and in 190 of them the veterinary surgeon, *with the help of the bacteriologist,* was able to discover one or more cows with tuberculous udders. After the removal of these cows, the milk generally ceased to produce tuberculosis in guinea pigs. At the remaining farms (about 31 per cent) the source of infection could not be found. From the inquiries made at these 86 farms, Delépine found that in at least 32 cases, cows had been sold between the time of collecting the sample and examining the cows; in others, the farmer had been buying milk from outside sources. From his inquiries he believes that in most of these cases the source of the tubercle bacilli was from a cow not on the farm, and gives as his estimate the following:—

Tuberculous udders the cause of infection	78.6 per cent.
Tuberculous udders probably the cause of infection	16.0 per cent.
Nothing definite to connect infection with the state of the cow ..	5.2 per cent.

All this goes to show that the ordinary milk supply may be seriously contaminated with the tubercle bacilli, and that even the consumption of the best of milk would render one liable to contracting tuberculosis. It must, however, be borne in mind that the ordinary healthy adult has natural powers of resistance to disease, and that the consumption of milk in the ordinary way would not produce a similar reaction to that obtained by inoculating a guinea pig.

It is interesting to note the following statements of the Royal Commission on Tuberculosis:—"Bovine tubercle bacilli are apt to be abundantly present in milk as sold to the public when there is tuberculous disease of the udder of the cow from which it was obtained . . . but these bacilli may also be present in the milk of tuberculous cows presenting no evidence whatever of disease of the udder, even when examined *post-mortem.* Further, the milk of tuberculous cows not containing bacilli as it leaves the udder may, and frequently does, become contaminated with fæces or uterine discharges of such diseased animals."

TUBERCULOUS MILK AS A CAUSE OF HUMAN DISEASE.

For a considerable period the fact that bovine tubercle bacilli could cause tuberculosis in man was a much disputed point. Koch, the great bacteriologist, in 1901, at the British Congress on Tuberculosis, stated that human and bovine tuberculosis were, for practical purposes, distinct diseases, and that the cases in which human infection results from bovine tuberculosis were so rare that special methods against bovine tuberculosis were not required. Koch's statement led to the appointment of a

British Royal Commission on Tuberculosis, and the general results of their investigations, which extended over many years, unmistakably demonstrated that bovine tuberculosis was a source of human tuberculosis. In their final report (1911) they state:

"... There can be no doubt that a considerable proportion of the tuberculosis affecting children is of bovine origin, more particularly that which affects primarily the abdominal organs and the cervical glands. And further, there can be no doubt that primary abdominal tuberculosis, as well as tuberculosis of the cervical glands, is commonly due to ingestion of tuberculous infective material." Further on, they state that "the evidence which we have accumulated goes to demonstrate that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine type, transmitted to children in meals consisting largely of the milk of the cow." And, again, "A very considerable amount of disease and loss of life, especially among the young, must be attributed to the consumption of milk containing tubercle bacilli."

Although, as already pointed out, the danger of infection is greatest in children, cases of abdominal tuberculosis of bovine origin often occur in adults.

EXTERNALLY CONTAMINATED MILK.

Apart from the cases just considered above, where the contamination of the milk was due to the diseased condition of the cow, it is quite possible, and very often happens, that the source of contamination lies in the conditions under which milk is produced. Thus, milk from a perfectly healthy cow can be rendered unfit for consumption unless proper precautions are taken to prevent its pollution.

The chief sources of contamination after the milk has been drawn from the cow are (1) in the milking-shed; (2) during transit to the consumer; and (3) on the consumers' premises.

1. CONTAMINATION INTRODUCED IN THE MILKING-SHED.

Undoubtedly the most serious contamination of the milk takes place in the milking-shed, and the results of numerous investigators prove that this is the source of most of the trouble. Reference has already been made to the possibility of the milk becoming infected from persons carrying the germs of some specific disease, and it is only by scrupulous cleanliness and supervision that the danger from this source can be avoided.

It is usually during the actual milking operations that the greatest contamination takes place. The hands of the milker, not even washed to commence with, soon become filthy from the dirt of the cow. The practice of wet-milking is almost universally adopted throughout Australia, being much easier to the milker, and more comfortable to the cow, and it is the usual thing for a thick coating of brown greasy dirt to be accumulated round the thumb and forefinger. From this, dirty drops of milk teeming with bacteria, find their way into the bucket, adding their quota to those already there. It is a common thing to see the flanks of the cows plastered with manure, and it is an easy matter to understand the serious nature of contamination from such a source. As an illustration of the great number of bacteria in manure, the following figures obtained by Orr may be quoted:—

Sample.		No. of Organisms per gramme.
Fresh manure one or two hours old	I.	725,000
	II.	3,500,000
	III.	8,430,000
Old manure cut off from the hardened fæces sticking to the udder and side of legs of the cow	IV.	185,000,000
	V.	13,050,000,000
	VI.	8,649,000,000

It is usually the old excreta which finds its way into the milk, and the variety of organisms is very numerous. It is often advocated that the cows should be kept groomed, but to do this just before or during milking greatly increases the contamination; in fact, any work likely to cause dust, such as feeding the cows, removing manure, or sweeping the shed, should never be done during milking.

At the Queensland Agricultural College the coats of the cows are kept entirely free from manure, and strict hygiene is observed during the milking operation. There, it is customary to moisten the cow's udder and wash her teats with a damp cloth, and the value of this simple operation is greater than one would imagine. Its purpose is, of course, to prevent the fall of dirt into the bucket, and the result of such treatment in reducing the number of bacteria is shown in the following table:—

Cow.	Number of Bacteria per c.c. in Milk.	
	Cows with Unmoistened Udders.	Udders Moistened.
1	10,160	1,200
2	13,500	3,500
3	200,000	4,300
4	215,000	3,500
5	180,000	2,000
Average	123,732	2,900

Another method of demonstrating the beneficial effect of moistening the udder prior to milking was employed. Sterile plates, containing a suitable medium for bacterial growth, were exposed under the udder of the cow for fifteen seconds, and the plate incubated for seventy-two hours at 22° C. The striking results from this experiment are shown in Figures 1 and 2.

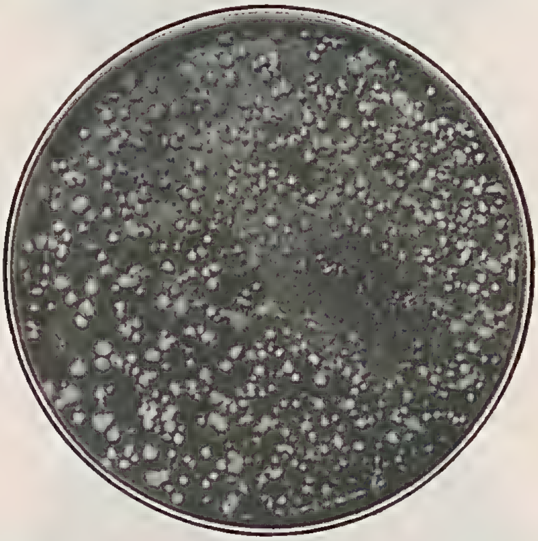

Fig. I.—Agar plate, exposed for 15 seconds under the udder of a cow during milking. Incubated for 72 hours at 22° C. Cow groomed about 14 hours before milking. Number of colonies = 1,350.

Milk vessels when improperly cleaned are also a source of great bacterial contamination to milk. In a series of experiments conducted by Orr, he rinsed out the milk cans with 100 c.c. of sterile water, and then estimated the number of organisms per c.c. of this water.

Series A.— Ten samples were examined from cans improperly washed, and gave from 215,000 to 806,320 organisms per c.c.

Series B.—Ten samples, from cans cleaned by washing with tepid water and scalding, gave from 13,080 to 93,400 per c.c.

Series C.—Five samples, from cans cleaned by washing with tepid water and then steaming for five minutes, gave from 355 to 1,792 organisms per c.c.

It is an almost universal practice of the dairyman to strain the milk, usually immediately after milking. It is not properly realised that the ordinary strainer is useless in keeping out bacteria, merely retaining the larger particles of manure, straw, &c. If not kept absolutely clean, it may actually add bacteria to the milk instead of reducing the number. The most efficient strainer consists of one fitted with a pad of clean cotton wool, not being used more than once, a fresh pad being substituted for the next milking. The essential thing that should be borne in mind is to prevent the entrance of impurities rather than relying on methods for their removal.

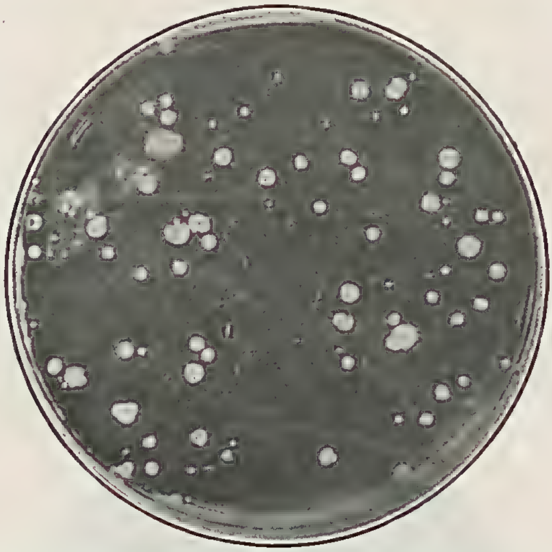

FIG. 2.—Agar plate, exposed for 15 seconds under the udder of same cow as above during milking. Incubated for 72 hours at 22° C. Cow groomed about 1 hour before milking, and udder washed with soap and water and left moist. Number of colonies = 93.

In washing dairy utensils special attention should be given to *separators*, which are a very important source of bacteria. These are frequently insufficiently washed—particularly hand separators. They are difficult to clean adequately, since it is commonly not easy to steam them. For this reason, all the more care should be exercised in using plenty of boiling water and soap, and steaming all parts that can be steamed.

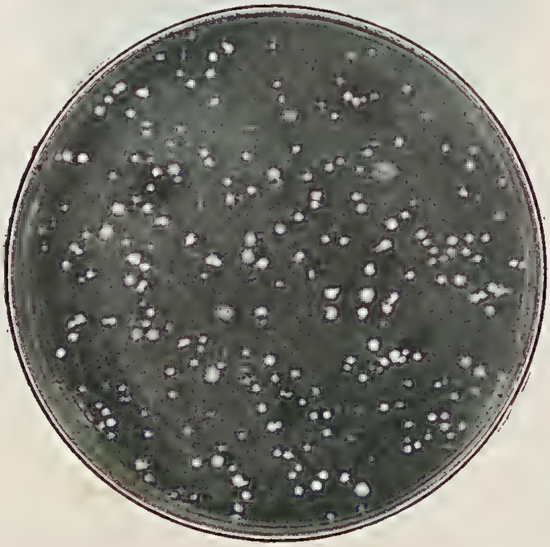

FIG. 3.—Agar plate, exposed for 1 minute in the milking shed. Incubated for 72 hours at 22° C. Air of shed still; cows resting. Number of colonies = 340.

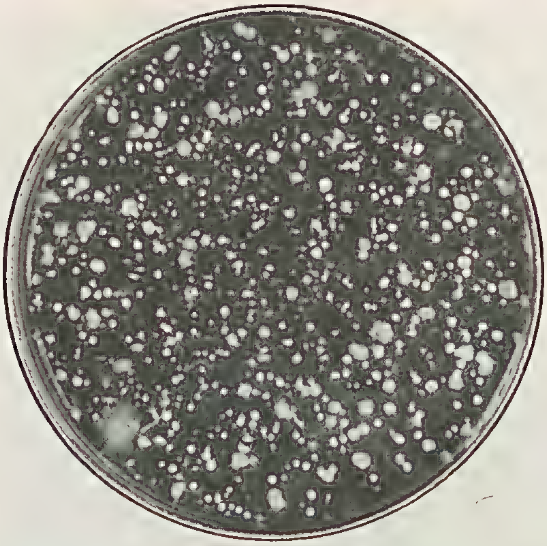

FIG. 4.—Agar plate, exposed for 1 minute in the milking shed during foddering of cows. Incubated for 72 hours at 22° C. Number of colonies = 1,310.

The effect of feeding the cows in the milking-shed and removing the manure has a marked effect on the bacterial content of the air. To demonstrate this fact, sterile plates were exposed to the air during the conditions as described above. The number of bacteria falling from the air on to the plates in one minute was determined. This method gives a fairly accurate figure for the bacterial content of the air at any time. When the air in the milking-shed was still, an approximately constant figure for the bacterial content was obtained. During the feeding of the cows and the removal of the manure from the shed, however, the bacterial content of the air was found to have considerably increased. A glance at the photographs of two of the plates as shown in Figures 3 and 4 will demonstrate the above.

USE OF MILKING-MACHINES.

In this country, milking machines are extensively used, and in view of the contamination of milk which results from ordinary methods of milking, they have been welcomed by some writers as a solution of the problem. As they are complicated

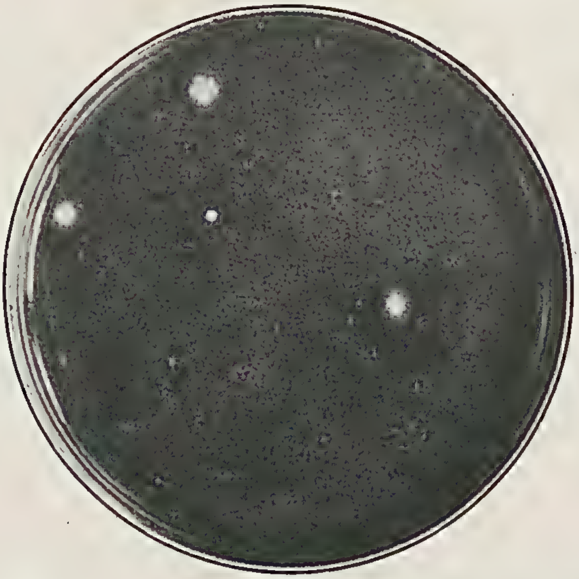

FIG. 5.—Cow No. 10.—Fore-milk rejected. Cow milked by hand. Dilution of milk, 1 in 100. Number of colonies = 33.

in construction, and most have a number of long rubber tubes, they are therefore extremely difficult to clean and keep clean, and in the hands of any but the most aseptic-minded persons, are almost sure to be an added source of bacteria rather than the opposite. The following figures will serve to illustrate this point. Samples of milk were obtained from a cow first by hand milking and then with a milking machine, the fore milk being rejected in each case. The milking-machine was looked after by a very careful dairyman, and was kept as clean as it could be under ordinary commercial conditions. After suitable dilution and incubation on agar, the milk obtained by hand milking yielded 33 bacterial colonies, while the milk from the same cow obtained by the milking-machine yielded no less than 2,323. (See Figures 5 and 6.)

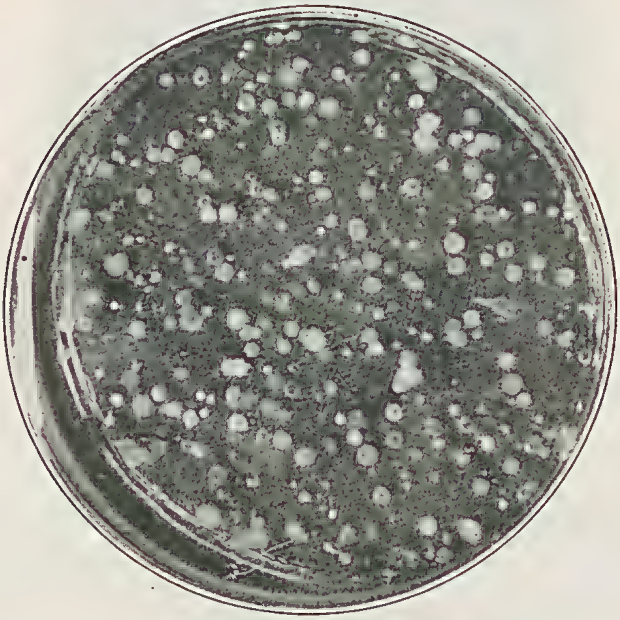

FIG. 6.—Cow No. 10.—Fore-milk rejected. Cow milked by machine. Dilution of milk, 1 in 100. Number of colonies = 2323.

At Wisconsin University, forty separate trials were made, the cows of the herd being milked continuously by a Burell-Lawrence-Kenedy milking-machine. It was found that the milk from the machine was slightly lower in bacterial content than that drawn by hand. The investigators concluded that "the success of machine milking will depend largely upon the man operating the machine, and on his attitude towards machine-milking."

CONTAMINATION DURING TRANSIT.

The question of transportation of milk from the farm to the consumer is an important one and resolves itself into two problems—1, temperature; 2, protection from contamination. The chief causes of contamination during transit are the use of badly constructed milk cans, the carriage of milk in unsuitable railway vans along with other miscellaneous goods, and undue exposure to dust and sun at railway stations, or on roads where dust is blowing about.

In Australia little or no provision is made for keeping the milk cool in the railway vans, and it is certainly no encouragement to the dairyman to cool it down when he knows that it is to be taken to the city at a temperature of about 80 degrees Fahr. or more. The importance of keeping milk cool cannot be too strongly emphasised, and in this country we should follow the American plan of having refrigerated railway vans for milk only.

In transportation, milk is usually sent in cans, and for practical reasons of economy this seems to be necessary for large supplies, although it would be a far better plan to transport it in glass receptacles if this were feasible. The cans used in transportation should have a tightly fitting cover, which overhangs the top, and thus prevents the entrance of dirt. But those often ordinarily used are themselves the source of much trouble, and the origin of much of the bacterial contamination of the milk. A glance at the battered, rusty, and dirty milk cans that one finds at a railway station, or at a milk-receiving depôt, will convince him that not a little of the bacterial content of city milk comes from transportation. Of course, the expectation is that these cans will be washed before milk is placed in them again, but battered rusty cans with seams are practically incapable of being washed clean by any method adopted in the ordinary dairy. Cleaner cans, and more frequent replacing of old with new ones, would do much toward improving the condition in which the milk reaches the city. In a paper recently read before the Farmers' Club (Journal of the Farmers' Club, May, 1919), Stenhouse Williams states that the losses due to bad methods of milk production and handling on a supply of 90,000,000 gallons, valued at 1s. per gallon, were not less than £536,000, and the loss due to souring alone on another supply of 75,000,000 gallons was not less than £37,500. These very striking figures show the importance to the milk trade of proper methods of handling and distributing milk, quite apart from any question of public health.

The ideal method in distributing milk to the consumer is to send it out in bottles closed with a disc and covered with a capsule which cannot be removed without tearing. At Toowoomba, the Darling Downs Co-operative Dairy Company is to be commended for following this practice. The delivery of milk in this manner has two great advantages. If properly filled in a clean place, and properly sealed, it prevents contamination during delivery, while it diminishes contamination after delivery. Its disadvantages are, unfortunately, many. The breakage of bottles is considerable, and makes the expense of using them great. Being heavy, a smaller quantity of milk can be carried round by one man. The bottles are also difficult to clean properly.

CONTAMINATION IN THE CONSUMERS' HOUSE.

The extent of contamination which the milk may receive after delivery to the consumer is difficult to estimate. In many cases faults and complaints that arise from him are due to his own carelessness and not to the character of the milk. He places it in a vessel that has not been carefully washed and that still contains some bacteria from the last sour milk which it held. It is then placed in a warm room and allowed to stand for some hours before being placed, if it ever is, in an ice chest. If placed in an ice chest, this is presumably filled with ice, but the ice frequently runs low, and the temperature rises. Under such conditions, especially in summer weather, trouble is sure to follow, and the milkman will receive the complaint that the milk will not keep, when the trouble is due entirely to the treatment from the consumer. For his own advantage, the consumer should be careful to place the milk in a clean vessel, keeping it properly cooled, and free from dust, and particularly from flies during the summer months.

GENERAL TREATMENT OF MILK.

Milk as produced at the present day will not keep fresh for any length of time, due to the fact (as has been demonstrated above) that it is heavily contaminated with bacteria, which multiply rapidly in the milk. The products of those bacteria spoil the milk. Further, we have the fact that a considerable period of time must elapse between the time the milk is obtained at the farm and its delivery to the consumer. To improve the keeping qualities of the milk, and to destroy, as far as possible, the bacteria present, and so lessen the risk of disease being conveyed by the milk, various artificial methods for the preservation of milk have been adopted.

Refrigeration.—The cooling of milk to a temperature of 50 degrees Fahr. inhibits the growth of bacteria to a considerable extent, thus ensuring that the milk shall remain "sweet" for a comparatively long time (*i.e.*, about forty-eight hours). It is to be noted, however, that cooling or even freezing does not destroy the bacteria present. Cooling to 50 degrees Fahr. or even lower gives quite satisfactory results, and its universal application is only a question of cost. It is efficient and harmless, there being no evidence that any prejudicial effects on the digestive properties of the milk result from refrigeration.

Pasteurisation.—Pasteurised or "sterilised" milk, as it is commonly called by the dairyman, means milk which has been heated to a temperature which it is hoped has killed the bacteria present. Like so many trade expressions, it does not mean what it says, or if it purports to mean it, it is not true, for no such thing as really sterile milk in the bacteriological sense is ever produced commercially. It is impossible to obtain sterile milk without greatly affecting the appearance, taste, and properties of the milk. The usual temperature employed in pasteurising milk is 62.8 degrees Cent. or 145 degrees Fahr., and the ordinary process, if efficiently carried out, kills all the disease-producing organisims, including the tubercle bacilli, so that from this point of view its use in the present state of the milk supply is to be strongly recommended. There are many pasteurising machines, involving different principles, but no matter which kind is used, it is essential that the milk should immediately be cooled on the completion of pasteurisation, and the risk of allowing it to become reinfected should be prevented.

An objection to pasteurisation is that, although pasteurised milk will sour, it sours much later, and so may be, and in practice often is, kept for a number of days. Old, stale milk may be sold as fresh owing to the removal of most of the lactic acid bacilli. Such milk will appear normal to sight and taste, but may be bacterially highly dangerous, containing many disease organisims.

Again, if used without statutory control, there could be but little doubt that the extensive use of pasteurisation would lead to neglect of general sanitary precautions even more completely than is the case to-day, under the belief that pasteurisation would be an efficient substitute for cleanliness.

The Effect of Heating on the Food Value of Milk.

It is well known that heating milk to certain temperatures reduces the activity or completely destroys certain enzymes or ferments naturally present in milk, and much controversy has arisen as to whether heating milk, as in pasteurisation, alters it sufficiently in composition to affect its value as a food for infants and young children. The subject has been submitted to direct experiment, and on the whole it would appear, taking all the facts into consideration, that there is no satisfactory evidence to show that cooked milk is either less easily digested or less easily absorbed from the intestine than raw milk. The loss of nutritive value by heating is also negligible.

It has been frequently asserted that boiling or otherwise cooking milk deprives it of its antiscorbutic properties, and that such milk is the cause of infantile scurvy, rickets, &c., but it is difficult to find definite evidence in favour of such an assumption. Considering our present state of milk supply, the advantages to be gained by pasteurisation would seem to far outweigh the supposed disadvantages.

Sterilisation by Electricity and Use of Ultra-violet Rays.

Beattie and Lewis, of Liverpool, have of recent years conducted experiments with a view to ascertaining the destructiveness of electricity on the bacterial cell, and its application for the practical purpose of sterilising milk. The milk is passed through a tube provided with copper electrodes, between which a high tension current of from 2,000-3,000 volts is passed. The destruction of the bacteria appears to be satisfactory. B. coli and allied organisims were completely destroyed. The cost (1916) varied from 0.85d. to 1.25d. per gallon according to the source of power employed. The use of ultra-violet rays for sterilising milk has also been advocated, and although most effective in destroying the organisims present in milk, the cost of doing so is prohibitive, making the use of these rays commercially impossible.

Condensation and Drying.

A brief mention of the condensation and drying of milk will be made here, for this treatment of milk plays an important part in solving the city milk supply. Delépine (Reports to Local Government Board on Public Health and Medical Subjects No. 21) investigated the effects of these methods on the bacterial content of milk, the following three processes being specially studied:—

1. Manufacture of sweetened condensed milk;
2. Drying milk over heated revolving cylinders;
3. Drying milk by spraying it into a current of hot air.

It was found that by the adoption of these methods a considerable reduction in the number of bacteria present in the milk took place, this reduction being greatest with the first and least with the last method, where a considerable amount of contamination took place after the drying.

It was observed that at all stages of the drying of the milk some bacteria remained alive, the tubercle bacillus being among them; but, although the number was higher than could be desired, the vitality of the organisms appeared to be so lowered that they were incapable of producing tuberculosis when inoculated into young rabbits.

If milk retained its desirable qualities after the drying process it would to a large extent solve the difficulty of our milk supply problem, and housekeepers would be able to always have a supply on hand. From their point of view it would prove most economical, the requisite amount being used as required, and its use would solve many of the problems of contamination. In Australia milk-powders are more than ever coming into daily use, some in the form of patent foods for infant feeding, and, although no details have been furnished, the general reports on their uses submitted to the conference on infant mortality held in London in 1913 were quite favourable.

BACTERIOLOGICAL STANDARDS.

At first sight it would appear that the difficulty of providing a pure milk supply could be obviated by the adoption of a standard of cleanliness, whereby every dairy farmer would be compelled to supply milk conforming to the number of bacteria allowed by the standard. It has often been proposed that the sale of milk containing more than a specified number of bacteria should be prohibited, but as the average milk when delivered in the city contains from 100,000 to 1,000,000 and more organisms per c.c., it is not an easy matter to decide on the number which shall constitute the standard. The standard proposed by many varies from 10,000 to 50,000 organisms per c.c. but, as the fitness of the milk for human consumption depends obviously not merely on the number of bacteria present, but on whether the milk contains disease-producing organisms or not, it can clearly be recognised that the establishment of a *numerical* bacteriological standard would prove of little value from a public health point of view. At present, only in a few places has the attempt been made to establish such a standard. Boston has tried to enforce a standard of 500,000 per c.c., while it is to be doubted if New York could reach 1,000,000. Many of the smaller towns in America have much lower standards, milk of a high quality of purity being sold under the name of "certified milk," produced by agreement between certain societies of medical men and dairy farmers. The milk is produced under most stringent aseptic conditions, and is submitted to regular bacteriological examinations, to ascertain whether the number of bacteria exceeds the standard of 10,000 per c.c. of milk. It follows that such milk costs more to produce than ordinary milk, but, in spite of this, it finds a ready market. The introduction of a system of grading, both as to quality and purity, is much needed in Australia, and the higher price obtainable for better quality of milk would act as a stimulus to the dairy farmer, encouraging him to improve the quality of his product. Our present system of selling milk at more or less the same price irrespective of quality or purity cannot be justified.

GENERAL.

It is not sufficiently realised that the production and distribution of pure milk is an industry requiring a highly intelligent set of workers, and most careful and thorough management. There is much need for a further education of those who produce and handle the milk as well as of those who consume it, and although the education given at our agricultural colleges in different parts of the Commonwealth is undoubtedly admirable for those who are going to become expert cheese and butter makers, or instructors, it does not reach a large proportion of those actually engaged in the handling of milk. The short six weeks' course given at Gatton College is excellent, and it is a matter of regret that more farmers or their sons cannot avail themselves of such instruction. Splendid work is being carried out by the Government Dairy Inspectors, their duty being to see that the conditions under which milk is produced on the farms conform with the legal requirements of the State, and to give advice to dairymen on the best method of producing clean milk. This Government supervision is necessary, for the idea that the average dairyman will of his own accord, without outside pressure, supply a clean milk instead of a manure-laden one, cannot be seriously entertained by those who have extensively discussed this matter with him. The writer has met a few dairymen who understand and appreciate the need for sanitary cleanliness, but very few compared with the number who regard such precautions as a silly fad. The great majority take refuge in the following argument in turn:—First, that they do take all necessary steps, and that practically nothing does get into the milk. Confronted with milkers with filthy hands, and with still filthier cows, they abandon this argument for the next, which is, that if anything does get into the milk the strainer removes it all. Strainer, with much gross manurial filth removed by it from the milk, produced in triumphant confirmation. With the significance of this explained to them they fall back upon their final plea, that perhaps manure does get into the milk, but it does not matter, and they milk like their fathers before them, and what was good enough for their fathers is good enough for them. The latter may be a true statement, but, as is explained to them, that is not the point, which is whether it is good enough for the milk consumer who may not desire what their fathers had. Their fathers had a heavy incidence of infectious disease, a heavy tuberculosis mortality, and always a high death rate. These are not good enough to-day. It is difficult to see how the reforms mentioned above are to be carried out effectively so long as the retail distribution of milk is in so many hands as it is at present. Our present methods are economically unsound, and render anything like adequate supervision and control quite impossible. A much greater organisation and centralisation of the distribution of milk is absolutely necessary, and without any exaggerated belief in the virtues of municipalisation, the writer is convinced that until some such action is taken our milk supply will remain very much as it is at the present time.

Horticulture.

THE IMPROVEMENT OF CULTIVATED PLANTS.

Lecture delivered at the Horticultural Society of Queensland's Show on 20th March, 1920, by Mr. R. W. Peters, Director Queensland Acclimatisation Society.

Probably no question is of so much interest and importance to horticulturists and farmers as the improvement of cultivated plants. Since the time of Mons and Knight this phase of plant culture has received considerable attention, but probably much less than it deserves. The experience of plant-breeders the world over has shown clearly that the possibilities in the improvement of useful plants are unlimited. The last half-century has witnessed huge extensions of the areas devoted to agri-horticulture, and this has led to a demand for new varieties of cultivated plants adapted to particular conditions of soil and climate, immunity to disease, &c., and, again, the maximum productiveness of most of our cultivated plants has not been reached, and much can still be gained in this direction in attempting to produce improved varieties.

There are several methods by which cultivated plants may be improved, the most important being by hybridisation, others being by sports, variations, mutations, and selection.

Few more agreeable occupations can be found for an amateur, and few more profitable for a professional in horticulture than that of creating new varieties of flowers, vegetables, and fruit, which shall be more productive and more beautiful than those now found in gardens.

For professionals who desire to make a commercial enterprise of plant-breeding there is one difficulty: they must know the varieties and species, &c., already in the trade of the genera which they undertake to improve. It is desirable, when attempting to secure new varieties, that one specialises in one particular genera, that being the way followed by many of the most successful horticulturists. One might take up roses, gladioli, petunias, carnations, or tomatoes, beans, peas, &c.

As an example of the methods adopted in the improvement or creation of new varieties I will take, firstly, the rose.

The old-time method of raising new varieties of roses was to indiscriminately collect from the nursery or collections all fruits obtainable, without paying any attention to the varieties which produced them. The rose fruits thus gathered were sown in pans or seed-beds and afterwards transplanted into nurseries. If, out of one thousand seedlings, half a dozen noteworthy new varieties were found, the raiser was well satisfied.

Naturally, under these conditions many variations were found, such as length of time taken to produce first flowers; some were single, semi-double, and double; some would bloom abundantly, and some scantily.

To understand how ordinary seedlings of roses cultivated in gardens could produce anything profitable, one must remember that many of them are descendants of cross-breeding. Now, it is well known that plants descended immediately or distantly from crosses or hybrids do not come true from seed unless fixed to type, which is seldom done in plants reproduced vegetatively. They are endowed with innate variability, characters separate combine to produce others, and run through a whole circle of variations which manifest themselves in various ways.

Simple propagation by seed is only recommended with separate varieties, and to follow the results by pedigree culture to the third generation. Pedigree culture offers two advantages: first, the planter is not required to waste time sowing seed from plants which produced nothing good in the first generation. If he does not want to carry his experiments any farther, he knows that he has missed nothing good so far as he has gone, but if he has the instinct for plant-breeding, he may find in succeeding generations, if not good novelties, at least good seed-bearers or pollinizers—that is, good mothers and fathers, often fairly semi-double, with which he can make productive crosses.

Good pollinizers or producers are rarely put in the trade by their originators, who keep the monopoly for themselves.

When taking up hybridising and cross-breeding one must remember that Nature has set a limit to the enlargement of flowers, to their florabundance, &c. Large size in flowers is more often obtained by using those of medium size than by using large flowers to commence with, unless the latter are semi-double. Too much duplication of petals is to be avoided, as the flowers do not open well. But double roses, when they possess good pollen, can be utilised to advantage as males on good semi-double females.

There are plenty of cases where beautiful roses are absolutely sterile, and with such it is waste of time to pollinate them, but if they possess good pollen, it may be used on other females.

There are few genera where artificial pollination is easier to perform than with the rose; its flowers are large, its stamens numerous, and its pistils easily seen. Furthermore, natural pollination rarely takes place before the flowers open. The organs of the rose are very simple; the calyx and petals are known to everyone. In the centre of the flower are the organs the plant-breeder needs to know, the stamens formed of threads carrying anthers—small yellow points containing pollen. These are the male organs. Finally, these are the styles sometimes united, often crowded together; these styles are terminated by a stigma at the apex, and an ovule or seed vessel at the base. It is on these stigmas that the pollen falls and fertilises the ovules.

To make a cross pollination, the rose to be pollinated, *i.e.*, the mother plant, should first be deprived of its stamens and the petals of the centre of the flower, in order that they may not interfere with pollinating operations. The emasculated flower should then be bagged to prevent fertilisation by insects. When the stigma becomes mucilaginous, pollen from the selected male parent should be placed carefully on the stigmas by means of a camel's hair brush. If many pollinations from different varieties are to be made, care must be exercised to thoroughly clean the brush by using a 40 per cent. solution of alcohol. The cross-pollinated flower should then be rebagged.

The ripened fruit should be sown separately in each variety, in pans, and brought to two or three generations.

In crossing a new type with single flowers, which is to be used as a polliniser, it is desirable to choose a fertile mother with double flowers and whose ancestors were double.

Lastly, roses give an excellent example of what is termed "bud variation." Every rosegrower knows that many of our varieties called climbing roses are varieties whose mothers were not procumbent by Nature, and that such varieties can be almost produced to order by taking buds from branches which show a tendency to extend; such extension can be stimulated by pruning, manuring, and a partially shady position. Bush roses can be produced in the same way by taking budwood from the neighbourhood of the inflorescence. Examples—William Alan Richardson, Mrs. W. J. Frost. Roses of hybrid origin are most likely to throw bud sports, and a grower who cultivates hundreds of each variety has an excellent opportunity of watching for branches or whole plants presenting characteristics worthy of being fixed, more abundant flowers, lighter or darker shades of colour, better foliage, or fewer thorns. How many sports are lost because not noticed.

BREEDING NEPHROLEPIS FERNS.

Ferns of the genus Nephrolepis can be divided into two groups, on the basis of their genetic behaviour; first, those which show variation only when propagated sexually by spores; and second, those which produce new varieties asexually.

The first group includes more than ninety species and varieties, all of which are either found growing wild or have been produced from spores by breeders. Of these may be mentioned the following commercial varieties: *Nephrolepis exaltata, cordata, compacta, plumosa, dovallioides,* and so on.

The second, and more interesting, is limited to the Boston fern, *Nephrolepis exaltata bostoniensis* and all its sports, of which there are many.

In a natural state ferns are often hybrid, the sexual organs being so located as to almost completely prevent self-fertilisation. The spores, found in large numbers as kidney-shaped, brown, fruiting bodies, on the under side of the leaflets, produce occasionally new forms when sown.

The ferns of the second group, that is, those derived from the asexual varieties, may also be propagated from spores, although by some these are considered sterile.

Most of the commercial varieties of *Nephrolepis* are sports of *N. exaltata.* This variety probably originated near Boston some thirty years ago. The first recorded sport of commercial importance occurred about 1898, and since then there have been produced over sixty-five commercial varieties.

In order to produce new types, it is necessary to raise a large number of different varieties. This can be profitably practised by persons who are engaged in growing ferns on a large scale, because they have under their observation a large number of plants growing for market. The plants, during their development, are closely examined, and those which show a tendency to differ in foliage or in habits of growth are isolated.

These variations, such as are found among ferns, may occur in a portion of a frond, or on the stem or rootstock, or on the runners. The only variations which are of value to the breeder are those which can be isolated. For instance, there is no way of isolating a variation which occurs on a portion of the leaf.

Sports which are commercially utilised and which are easiest to isolate are those which appear on some portion of the runner, where new-rooted fronds are produced.

The following are a few of the characteristics to be considered in the merit of a new fern. The plant must be either an improvement over another form, or be a class by itself. Rapidity of growth is a factor which concerns chiefly the wholesale florist. There are three growth characters which are desirable. In the first place, the fronds should develop rapidly; numerous buds should arise in the central area of the plant to give it a dense form; and finally, it should send out runners freely. Not less important is the uniformity of the size and shape of the smaller leaves known as pinnæ; the plant should show no tendency to revert or show any variation in any part of the leaves.

The questions of sports and variations have both been mentioned in this paper, but there still remains mutation and selection to deal with.

Mutations are conditions in plant life which in some cases occur suddenly, much in the same way as bud variations do. Moreover, this phenomenon is stated to occur at one particular period of the life of a species, and is confined to certain forms. The species may exist for years without any material change, and then all of a sudden the plant may enter upon a period of "mutation," new forms being developed. Why, how, and under what conditions this sudden change occurs is not explained. The best example of a mutant is the evening primrose, *Œnothera lamasckiana.*

Selections.—When growing large quantities of a certain crop, as, for example, flax, by taking careful observations, differences will be noticed. Some few plants may have a more branched flower head, and others may have a better unbranched length of fibre, and by careful selection and growing on of these slightly better factors, a crop of more commercial value may be obtained. Many cereals have been very much improved in this way.

SOCIETIES, SHOW DATES, Etc., 1920.

Gladstone.—Port Curtis Agricultural, Pastoral, and Mining Association. Show dates, 25th and 26th May, 1920. Secretary, J. T. W. Brown.

Beenleigh.—Agricultural and Pastoral Society of Southern Queensland. Show dates, 23rd and 24th September, 1920. Secretary, F. H. Wuth.

Wallumbilla.—Wallumbilla Agricultural and Pastoral Association. Show dates, 25th and 26th May, 1920. Secretary, F. C. Hawes.

Toowoomba.—The Royal Agricultural Society of Queensland. Secretary, G. Noble. The annual exhibition will be held on 20th, 21st, and 22nd April, 1920.

Nanango.—Nanango Agricultural, Pastoral and Mining Society. Show dates, 12th and 13th May, 1920. Secretary, G. Lee.

Wondai.—Wondai Agricultural, Pastoral, and Industrial Society. Show dates, 19th and 20th May, 1920. Entries close on 3rd May. Secretary, G. D. Griffith.

Orallo.—Orallo Branch of the Queensland Farmers' Union. Secretary: Ern. A. Thomas.

Mackay.—Pioneer River Farmers and Graziers' Show Association. Consequent on the resignation of the late Secretary, Mr. Frank Black, Mr. Ralph G. Johnson has been appointed Secretary to the above Association.

Entomology.

I.—THE BANANA WEEVIL *(COSMOPOLITES SORDIDA, Chevr).*

(Plate 13.)

By HENRY TRYON, Government Entomologist.

Introductory.

This banana-injuring insect, whose original home is unknown, is not a native of Australia. It has been found in Brisbane in banana plants from Jamaica, Ceylon, Singapore, Philippine Islands, Fiji, and Papua. Indeed specimens were received from British New Guinea already in August, 1887.

For at least twenty-five years, however, *Cosmopolites sordida* has been present in this State, having been met with, in May, 1896, at Mackay in banana plants (it was said) from Brisbane. Actual specimens from the latter locality were not, however, obtained until 1899.

In 1896 the Department of Agriculture secured the proclamation of a stringent regulation under the Diseases in Plants Act of that year, aiming at its further exclusion.

Since 1896 its occurrence at Mourilyan, Mount Jukes Mackay, and at several places, between Gympie and the Tweed River inclusive, on the east coast has been established.

In addition to the insect under consideration, a second banana weevil, *Metamasius hemipterus,* Lin., has occurred on banana plants here on their arrival from Jamaica.

The banana weevil may be found in association with the banana in all its four different life phases, *i.e.,* egg, larva, pupa, and beetle.

Description.

The Adult or Beetle (Plate, figures 4 and 5, 4*a* and 5*a*).—This resembles generally in form the ordinary grain weevil, but is many times its size. It is black (chestnut brown when young), dull—having a thin grayish surface incrustation—when abraded, glossy otherwise. The three divisions—head, mid-body, and hind-body—are very distinct. The two latter are of about equal length; the hind-body measures about 1½ times that of either of them. The wing-covers (elytra) have numerous low ribs, each separated by narrow furrows (punctured striæ) from its fellow. The true membranous wings folded beneath them are well developed, greatly exceeding these wing-covers in size and length. The mid-body, bowed on each side, is covered above by numerous minute points. The head is sunk in the mid-body to the middle of the eyes, and has a long narrow downwardly curved beak or proboscis (rostrum). The feelers (as usual in weevils) are elbowed. The legs are stout, and have a sharp curved spur or thorn at the end of each foreleg. The sexes are nearly alike; the female weevil, however, has the proboscis slightly longer and narrower than occurs in the male. Length, 9 mm. by 3 mm. to 14 mm. by 4½ mm.; average size, 12 mm. by 4 mm. (*Note.*—1 millimetre (mm.) = 1-24 inch.)

The Egg (Plate, fig. 1 enlarged).—This is minute, pale-yellow, regularly oval, and measures $1\frac{3}{10}$ mm. long and $\frac{6}{10}$ mm. broad.

The Larva or Grub (Plate, Fig. 2).—This is white, fleshy, soft, and legless. Except for the presence of a few hairs at each end and on its thorax, it is naked. The head is light-brown. The shield on the first segment of the body beneath is colourless, however. Deep wrinkles cross the body above, and the eleven true body segments are recognised by divisional lines beneath. The body is not of even girth, but suddenly swells out beyond the fifth segment to a width of more than twice what it is before; then it suddenly narrows to a round projecting hind-segment. The larva attains a length of 20 mm. and a width of 8 mm.

The Pupa (Figure 3) is naked, and at first yellowish-white. It reproduces the appearance of the beetle—the proboscis, its feelers (antennæ) bent back, the limbs folded up, the wing-covers and wings elongate pad-like. The divisions of the hind-body—now uncovered by the wing-covers—are very distinct; whilst this also ends squarely in four little projections above and two spine-bearing cushions beneath. Its length is ½ inch.

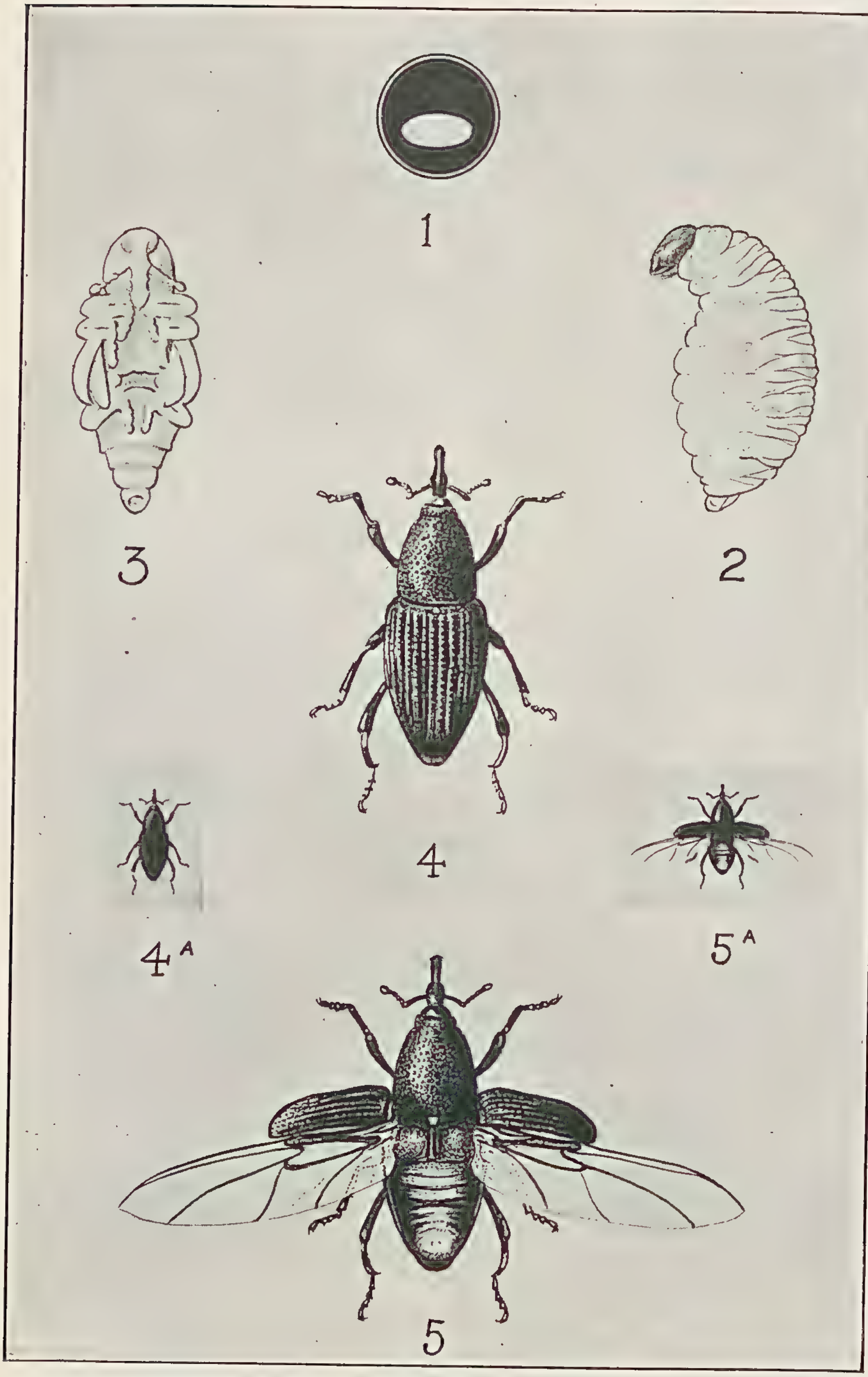

PLATE 13.—THE BANANA WEEVIL (*Cosmopolites sordidus*), Chevr.

1. Egg (magnified). 2. Larva or Grub. 3. Pupa. 4 and 5. Beetle or Adult—4, with wing covers closed (magnified); 5, with wing covers open and wings extended (all as magnified); also 4A and 5A, same (natural size).

Habits.

The beetle favours situations that agree with it in general colour and so lend their assistance in its concealment. These are usually in or on the banana near the ground. It is nocturnal in its movements, or at least principally active after sunset. Assisted by hook-like processes at the ends of its forelegs, it clambers in or out of less exposed places in the banana-stool or stem; whilst it uses its ample wings in flying through the air. When disturbed it draws in its legs, and becomes motionless, relying for protection on its colour and hardness. It moves about principally when in quest of food for itself or suitable places for the subsistence of its young (the larvæ). Its food appears to consist principally of the fermenting juices, developed upon cut-surfaces of the bases of suckers or in other portions of banana plants that have commenced to decay; but it rends into small fragments portions of the starchy corm, feeding on this also. In its migrations it will visit even plants (suckers) already packed for delivery, and lay its eggs in these. These eggs are deposited singly, and placed upright in little cavities or holes, excavated by aid of the jaws terminating its "snout," by the parent beetle. The minute size, colour, and isolated occurrence of these eggs render their detection in the field impracticable generally, even by the trained observer. From observations made by H. Jarvis, it would appear that each female beetle at a single period lays 14 eggs or less—usually from 9 to 11. Individual beetles are, however, long lived, their existence being extended to months; and, apparently, as happens with other beetles, at intervals successive batches are laid.

The larva, on hatching out, mines in the living tissue of the banana root-stock or corm, its tunnel being approximately circular in section, and moreover filled with particles of food that it has rejected. At first this tunnel is very small and inconspicuous: for in fact, since little or no air can get access to its walls, these do not discolour, and so assist in making it otherwise. As, however, the "grub" attains full size, its mining and feeding take place nearer the surface than before; and, therefore, not only now have the tunnels become much wider, but being exposed to the air the surrounding tissue may have blackened and partly broken down; and this occurrence, and the presence, too, of abundant sawdust-like particles, renders detection of this insect attack now evident enough.

After living as a larva for about three weeks, a small oblong chamber is gnawn out by the insect, usually just beneath the surface of the root-stock, but at times further within; no true cocoon is, however, fashioned by it. Here it comes to rest and, casting its skin, becomes a pupa as described.

And after six to eight days spent in this resting stage of the pupa, the insect now gives rise to the adult or beetle. This beetle may not, however, break its way out—the next step taken—for some days; whilst meanwhile its soft body, at first quite pale-coloured and delicate, becomes of a darker and darker chestnut, and more and more robust, until finally it is black, and of special rigidity.

Arrived thus at the final stage in their development, the sexes mate, and in due course lay their eggs on the banana plant that has witnessed their appearance or on other ones or parts of ones more or less distant from it.

Flying, taking place at night, is not directly observable. On two occasions we have found the beetle at a distance from any banana-cultivation. But evidently the insect does not fly far as a rule, when occurring where the banana already grows and it can exercise its mating habit.

Since five or six weeks only are occupied in the passage from egg to mature insect or beetle, there is time for several broods of weevils to be produced during the summer months alone; a fact known to occur.

No visible injury, or effect on growth, may be realised until the plant in which the beetle is established harbours many insects. The presence of the Banana Weevil may therefore for a while escape detection.

Detection of Occurrence.

When present in some numbers, the banana-plant in which the weevils or weevil larvæ occur may exhibit the ordinary symptoms of poverty and arrested growth, notwithstanding many insects may occur in a stool without any such symptoms being shown. At the same time other injurious agencies may produce similar effects. A tall-growing banana, *e.g.*, lady's finger or sugar banana, under severe attack, may, however, topple over; so again many young and recently set-out plants die where they have grown.

As a general rule, it will be noted that affected plants are "suckering very badly," or not suckering at all.

These indications should suggest cutting away slice by slice downwards the old stool whence these suckers arise; or similarly removing parts of the root-stock of the sucker itself, when—if the insects are present—their workings, as described above, may sooner or later be discovered. So also specimens of the banana weevils themselves, in one stage or another, of their growth.

However, when inspection is restricted to the suckers alone, and attack by the insect is of recent occurrence, it is not practicable to decide from such inspection whether they be weevil-infested or not.

Portions of banana plants and of the corm (rootstock) especially, detached suckers, and in some instances these on being planted even, whenever occurring within the range of the adult beetle, will attract it and serve it also in raising its progeny. Thus, too, they may act as a means for early discovering its presence.

This remark, too, applies to the material occurring at the base of banana stools.

Addendum.—Since there are several beetles (*Sphenophoridæ*) occurring in Queensland that more or less closely resemble the one herein dealt with, banana-growers who may encounter an insect that they regard from the foregoing description and figures as being the depredator in question, should take steps to verify their conclusion, submitting to this end a specimen or specimens to the Entomologist for identification.

REMEDIES SUGGESTED.

By ALBERT H. BENSON, Director of Fruit Culture.

These are either precautionary or for the definite purpose of destroying the beetle in any form in which it may exist.

PRECAUTIONARY MEASURES.

These must on no account be neglected, as it is easier to keep the beetle out of a plantation than to exterminate it once it has established itself. Growers should therefore take the greatest care to see that the suckers they plant are perfectly free from the beetle in any stage of development, and be satisfied that there are no beetles in the plantation from which they are obtaining them, or in the district in which the plantation is situated. The Diseases in Plants Act provides that no banana suckers can be sold in which the beetle is present, and growers are warned that, if they dispose of such, they render themselves liable to prosecution. At the same time, the intending planter should examine every sucker separately and thoroughly as soon as he receives them, and if he has the slightest suspicion that a sucker is not perfectly sound, he should destroy it at once.

DESTRUCTION OF THE BEETLE IN INFESTED PLANTATIONS.

1st. Where the Banana Plantation is Badly Infested.—There is only one remedy—total destruction.

2nd. Where the Infestation is Slight.—Every infested stool must be taken out and destroyed, and the beetles systematically trapped by placing a number of traps (which consist of fully developed bulbs or corms cut in half and placed cut side down on the ground) around the infested stool or stools, and collecting the beetles attracted to the traps at frequent intervals. If this work is well carried out, the plantation will continue to yield good returns of fruit for two or three years, but eventually the whole of the plants must be taken out and destroyed. No suckers may be removed from the plantation.

HOW TO DESTROY INFESTED PLANTS.

So far, the only effectual method of destroying infested plants is to dig out, chop into small pieces, and make them into a compost heap with fresh horse manure or chopped green grass or weeds, so that the mass will undergo fermentation, and generate enough heat to kill the beetles. Burning is out of the question, as the corms are very hard to burn, and the cost is too great. Chopping into small pieces and laying them on the ground to dry up is being tested, but wherever practical the compost heap is preferable, as the refuse forms a valuable dressing for the soil. The greatest care must be taken to destroy every part of the plant, and leave nothing for the beetles to feed upon, as the only way to be certain of exterminating them from any area is to destroy as many as possible and to starve out any that may escape.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon cane grub investigations for the month of February from the Entomologist, Dr. J. F. Illingworth:—

Cane farmers in North Queensland certainly have their full share of difficulties to contend with—a fact one does not fully appreciate until he tries to grow cane himself.

After passing through an unprecedented drought, which, where it did not kill out the cane entirely, retarded its growth many months; then the rains, when they did begin, were accompanied by a cyclonic storm of such fury that the remaining crop was laid flat on the ground.

Naturally, these vicissitudes and difficulties experienced by the growers have seriously affected experimentation, setting my work back practically a whole season. As stated previously, the experiments with arsenic I have had to limit to ratoons.

Mr. Dodd, who was stationed at Greenhills during the whole emergence of the beetles, was able to make some interesting observations, for the pest came out, on that estate, in great numbers, in spite of the extended drought.

EMERGENCE OF *LEPIDIOTA ALBOHIRTA.*

As I had anticipated, the flight of beetles was rather meagre at Meringa, and did not last long. Unexpectedly, however, immense numbers emerged at Greenhills, where the soil is of a loose, friable nature. Though the crops there suffered severely last year, I expected that the continued drought would give them a serious set-back, for the majority of them have to wait for the heavy rains before they are able to dig themselves out, since their pupation chambers are usually at a depth of several feet.

The first specimens that emerged were badly rubbed and worn—evidently those that pupated near the surface, where they suffered from the extreme dryness. A good many of these were seen dead on the surface, where they had succumbed soon after emergence.

Evidently the soil in the lower levels retains enough moisture to carry the beetles over severe droughts safely, where their pupation chambers are deep enough. It appears to be their nature to go deep for this very reason—they have been found at depths of 6 feet, or more; the majority pupating at 2 to 3 feet. In rare instances, however, in localities where the fields were wet at the time of the submergence of the grubs, I have found them pupating only a few inches under the surface, where they are easily turned out by the plough.

OBSERVATIONS ON FLIGHT OF BEETLES.

By working early and late, Mr. Dodd was able to formulate definite conclusions upon the movements of the beetles. After emergence from the soil, which takes place at dusk, the beetles flew about rather erratically at first, but the general movement was toward the feeding trees, even when a light breeze was blowing from that direction. They appear to know instinctively where to go.

Later, in making observations to determine when the beetles return to the cane to oviposit, Mr. Dodd found that this flight invariably takes place in the morning, just before daybreak. At this time there was no breeze blowing, but it is interesting to note that the beetles flew directly into the cane, following the general direction of the prevailing winds, *i.e.*, from the south-east and east. This may be only a coincidence, but it agrees with our former observations as to the distribution of the infestation, as shown on sketches of both the Greenhills Estate and the Gordonvale Farm, published in Bulletin No. 8.

The beetles invariably settled on the cane, and remained perfectly quiet for a considerable period—none of them eating or attempting to enter the soil. Later in the day, however, Mr. Dodd saw one drop off and dig itself in; so, evidently, as the sun warms up they seek this seclusion.

Beetles collected under these conditions all proved to be females; and dissection showed that they were weighted down with between two and three dozen fully developed eggs.

LEPIDIOTA FRENCHI ACTIVE.

As indicated in last report, this species appears to be on the increase in cane areas. In fact, these grubs have appeared this season in fields never before infested. This being especially true in old forest lands, with rather heavy clay soils, which have always been considered immune.

ARSENIC (ARSENIOUS ACID) FOR CANE GRUBS.

During the month I have started extensive experiments, both at Greenhills and at Meringa. In the case of ratoon cane, I had furrows opened up with a pony-plough, along each side of the rows, and as near to the stools as possible. The poison was then dusted into these, and they were filled with the scarifier before the roots had time to dry out. By this method the poison is placed where the young grubs can readily find it when they begin their activities, and, I hope, before they have time to do serious damage to the cane roots.

Methods of application of the poison have been under investigation, and it will be of interest to record our results. I first thought of using a machine on the plan of the corn-planters; but this was soon found to be impractical for distributing such small amounts, especially as I desired to scatter the poison evenly on both sides of the row.

Working on the plan of that used in the Southern United States for dusting arsenic on cotton plants, I rigged up tins with fine sieve bottoms, and attached each to a slender, upright stick, about 4 feet in length for a handle. This enabled one when walking beside the row to hold the tin just over the furrow, and by constant tapping upon the stick handle to dust the poison evenly.

We found that the amount distributed could be easily regulated, both by the vigour of the beating upon the handle and the rate at which one walked. In practice one can easily apply 20 lb. per acre when walking at a rapid rate; and, by going slowly, and beating harder, it is not difficult to put down even 80 lb.

In these experiments I used arsenic at the rate of 20, 40, 60, and 80 lb. per acre, hoping to secure conclusive results.

It will be recalled that in my laboratory experiments with arsenic, grubs died very quickly when placed in pots of soil containing minute quantities of this poison. This is explained, because it is their habit to constantly ingest quantities of soil, absorbing the organic matter from it. In fact, it is recognised that they prefer this method of feeding, unless forced by the poorness of the soil to feed upon living roots.

THE CABBAGE MOTH.

''This very destructive pest,'' writes Mr. C. French, Government Entomologist, Victoria, ''is one that causes an immense amount of damage; and among market gardeners throughout many parts of the world the losses occasioned through the attacks of these insects are enormous.'' In his valuable work, ''Handbook of the Destructive Insects of Victoria,'' he says that the ''Cabbage Moth,'' ''Diamond Back Moth,'' and ''Green Worm of Cabbage'' are one and the same insect. The eggs, which are of a dirty-white colour, are deposited in large numbers on the leaves of cabbages, on turnips, and other plants of the same natural order. They are also found deposited on the sides of crates in which cabbages and cauliflowers are packed for transport; and this is a constant and fertile source of danger in the way of carrying the pests from one place to another. The caterpillar is less than half an inch in length, green in colour. Mr. H. Tryon, Government Entomologist, Department of Agriculture in Queensland, says it is found throughout the whole world from Greenland to New Zealand and Australia. The outer leaves of the cabbage are the most affected, but Mr. French says that he has found the grubs in the very centre of the heart, but the cocoons are mostly found on the outer leaves.

As to prevention and remedies, a commencement must be made with the young cabbage or cauliflower plants whilst in the seed beds, and again before being finally planted out into permanent positions.

It would appear from the English ''Gardeners' Chronicle'' that one of the cheapest and most effective remedies is to take 1 lb. of coal-tar and boil it in a couple of gallons of water, and when boiling, dilute, in the proportion of two gallons of the liquid, as taken from the boiler, with 100 gallons of fresh water. Brackish water should not be used. Having diluted it, it should be well stirred, so that the water may become impregnated with the tar flavour. Water with a fine-rose watering-pot the beds in which the plants are growing; tar, in any form being very obnoxious to insects in general, and to small grubs in particular.

A weak kerosene emulsion, say, 1 part of emulsion to 25 or 30 of water, though, this, of course, is more expensive.

Before applying the tar water or emulsion, care must be taken that the plants are not previously disturbed, otherwise many of the grubs may absent themselves only to crawl up the stems after the danger has passed.

Give the plants a thorough watering (the rose must be a fine one to do the work thoroughly). Spraying is, of course, the best system, and after having gone through the beds, water with the same material a narrow space round the beds, as the larvæ which have fallen to the ground will be on the lookout for a chance to escape, but will seldom attempt to cross the line of tar-impregnated surface of the soil, where they will soon die.

Before planting, the bundles of young plants should be submerged in a decoction of weak tobacco water, to which a little soap and tar water could, with advantage, be added. In this, they should remain for fully an hour, when they could be dipped in clean water and planted out into the positions in which they are to remain until required for market.

Our plants may now be supposed to have been set out where they are to remain, and an occasional spraying would be the best and, in the end, the cheapest. The cabbage aphis also cannot stand the smell of tar, so these two destructive pests can be fought at the same time and almost by the same method.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1920.	Feb., 1919.
North Coast.	In.		In.	In.
Atherton	9·29	19	7·11	1·81
Cairns	14·83	38	18·73	7·85
Cardwell	16·87	48	9·60	8·88
Cooktown	13·53	44	14·62	10·29
Herberton	7·42	33	5·12	2·81
Ingham	15·44	28	11·97	6·05
Innisfail	19·64	39	13·81	11·32
Mossman	14·84	12	18·95	16·46
Townsville	11·98	49	4·00	8·36
Central Coast.				
Ayr	9·20	33	4·16	2·54
Bowen	8·80	49	0·77	3·73
Charters Towers	4·52	38	0·78	2·21
Mackay	11·61	49	3·54	6·05
Proserpine	10·75	17	3·07	4·94
St. Lawrence	8·11	49	2·15	1·55
South Coast.				
Biggenden	3·84	21	0·73	2·71
Bundaberg	6·34	37	0·32	3·22
Brisbane	6·40	69	1·04	0·89
Childers	6·19	25	0·55	3·77
Crohamhurst	14·33	27	3·85	3·10
Esk	5·66	33	0·79	0·53
Gayndah	4·23	49	0·25	1·93
Gympie	6·68	50	1·85	2·63
Glasshouse M'tains	8·90	12	2·56	2·71
Kilkivan	5·13	41	0·18	1·83
Maryborough	6·60	49	1·22	2·40
South Coast— continued:	In.		In.	In.
Nambour	8·66	24	5·05	5·06
Nanango	4·45	38	0·60	2·58
Rockhampton	7·70	33	1·55	3·31
Woodford	9·11	33	1·73	2·36
Darling Downs.				
Dalby	2·97	50	0·68	3·38
Emu Vale	2·36	24	0·55	1·54
Jimbour	2·98	32	0·73	2·13
Miles	2·72	35	1·15	1·29
Stanthorpe	3·38	47	1·57	2·58
Toowoomba	4·44	48	0·70	0·76
Warwick	3·01	33	0·80	2·24
Maranoa.				
Roma	3·11	46	4·08	3·33
State Farms, &c.				
Bungeworgorai	2·95	6	3·30	5·15
Gatton College	3·05	21	0·18	0·55
Gindie	2·88	21	0·73	1·57
Hermitage	2·52	14	0·80	2·97
Kairi	6·47	6	...	2·65
Sugar Experiment Station, Mackay	10·27	23	3·06	6·75
Warren	4·86	6	1·40	2·55

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February this year, and for the same period of 1919, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Botany.

RESULTS OF FEEDING EXPERIMENTS WITH A SUSPECTED POISONOUS PLANT.

(*WICKSTROEMIA INDICA*, C. A. MEY).

By C. J. POUND and C. T. WHITE.

DESCRIPTION.—A shrub with a reddish, very fibrous bark. Leaves about 2 inches long, tapering towards each end. Flowers greenish-yellow, small (about ¼ inch long), borne in little clusters at the ends of the branchlets. Fruit red, fleshy, oval or oblong, about ¼ inch or more long.

Common Name.—It is commonly called ''Tie Bush,'' a name, however, that is also applied to several plants of the closely allied genus *Pimelea.*

Suspected Poisonous Properties.—It is commonly sent in as a plant suspected of causing losses amongst stock, particularly in the ''scrub'' areas of South-eastern Queensland, and Bailey has several times* referred to its suspected poisonous properties. In the following feeding experiment, however, as the plant is one generally avoided by stock, the animals ate a great deal more than they would under ordinary conditions, and it appears to have had no other effect on them than to cause severe scouring. Had the feeding been continued, the animals would quite likely have died from scours and malnutrition, but stock would hardly ever eat sufficient of the plant for this to occur under natural conditions.

FEEDING EXPERIMENT WITH LEAVES OF ''TIE BUSH'' (*WICKSTROEMIA INDICA*), COMMENCED 6TH FEBRUARY, COMPLETED 18TH FEBRUARY, 1920.

BLACK JERSEY HEIFER. No. 421.

DATE.	EXPERIMENT.	RESULT.
Feb. 7 ..	5 p.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 8 ..	6.30 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 8 ..	12 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 8 ..	5 p.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 9 ..	12 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	None eaten.
Feb. 9 ..	5 p.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 10 ..	6.30 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 10 ..	12 a.m.—Fed with 1 lb. leaves and 5 p.m. 2 lb. chaff.	All eaten.
Feb. 11 ..	6.30 a.m.—Fed with 1 lb. leaves and 2 lb. chaff.	A little eaten; scours.
Feb. 11 ..	12 a.m.—Fed with 1 lb. leaves and 5 p.m. 2 lb. chaff.	None eaten.
Feb. 12 ..	6.30 a.m.—Fed with 1 lb. leaves and 2 lb. chaff.	None eaten; scours, with traces of blood; temp. at 3.30 p.m., 102.4°.
Feb. 12 ..	12 a.m.—Fed with 1 lb. leaves and 2 lb. chaff.	Very little eaten.

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* F. M. Bailey and P. R. Gordon, "Plants Reputed Poisonous to Stock," p. 75; F. M. Bailey, "Weeds and Suspected Poisonous Plants of Queensland," p. 172; and "Queensland Flora," p. 1369.

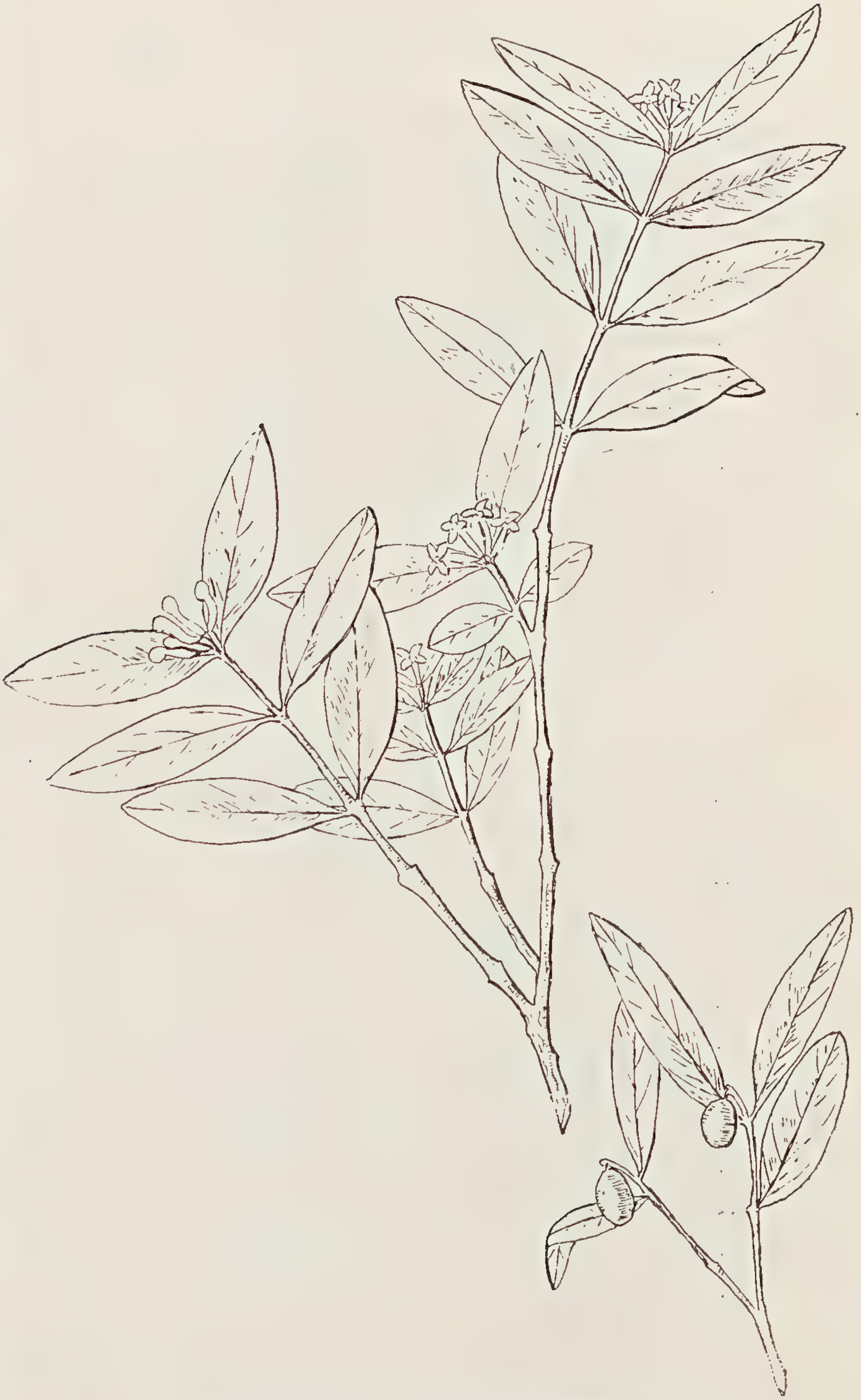

Plate 14.—Wickstroemia indica.

A. "Tie Bush." Flowers greenish-yellow. Berries red.

BLACK JERSEY HEIFER. No. 421.—*continued.*

DATE.	EXPERIMENT.	RESULT.
Feb. 12 ..	5 p.m.—Fed with 1 lb. leaves and 2 lb. chaff.	All eaten.
Feb. 13 ..	6.30 a.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	Mostly all eaten; scours.
Feb. 13 ..	12 a.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	Mostly all eaten; temp. 3.30 p.m., 102°.
Feb. 13 ..	5 p.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	Very little eaten; scours.
Feb. 14 ..	6.30 a.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	Very little eaten; scours.
Feb. 14 ..	12 a.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	Very little eaten; scours.
Feb. 14 ..	5 p.m.—No Tie bush available. Fed with chaff.	Condition improved; scours.
Feb. 15 ..	— No Tie bush available. Fed with chaff.	Slightly better.
Feb. 16 ..	6.30 a.m.—No Tie bush available. Fed with chaff.	
Feb. 16 ..	12 a.m.—Fed with 1½ lb. leaves and 3 lb. chaff.	Mostly all eaten.
Feb. 16 ..	5 p.m.—Fed with 1½ lb. leaves and 3 lb. chaff.	Mostly all eaten.
Feb. 17 ..	6.30 a.m.—Fed with 1½ lb. leaves and 3 lb. chaff.	Mostly all eaten.
Feb. 17 ..	12 a.m.—Fed with 1½ lb. leaves and 3 lb. chaff.	Mostly all eaten.
Feb. 17 ..	5 p.m.—Fed with 1½ lb. leaves and 3 lb. chaff.	Condition same.

YOUNG YELLOW JERSEY HEIFER. No. 416.

DATE.	EXPERIMENT.	RESULT.
Feb. 7 ..	5 p.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 8 ..	6.30 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 8 ..	12 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 8 ..	5 p.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 9 ..	12 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	Very little eaten.
Feb. 9 ..	5 p.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 10 ..	6.30 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	Very little eaten.
Feb. 10 ..	12 a.m.—Fed with ½ lb. leaves and 2 lb. chaff.	All eaten.
Feb. 10 ..	5 p.m.—Fed with 1 lb. leaves and 2 lb. chaff.	All eaten.
Feb. 11 ..	6.30 a.m.—Fed with 1 lb. leaves and 2 lb. chaff.	All eaten.
Feb. 11 ..	12 a.m.—Fed with 1 lb. leaves and 2 lb. chaff.	All eaten.
Feb. 11 ..	5 p.m.—Fed with 1 lb. leaves and 2 lb. chaff.	All eaten.
Feb. 12 ..	6.30 a.m.—Fed with 1 lb. leaves and 2 lb. chaff.	All eaten.
Feb. 12 ..	12 a.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	All eaten; scours, with traces of blood.
Feb. 12 ..	5 p.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	All eaten; temp. at 3.30 p.m., 101.8°.
Feb. 13 ..	6.30 a.m.—Fed with 1½ lb. leaves and 2 lb. chaff.	All eaten; scours.

YOUNG YELLOW JERSEY HEIFER. No. 416.—*continued.*

Date.	Experiment.	Result.
Feb. 13 ..	12 a.m.—Fed with 2 lb. leaves and 2 lb. chaff.	All eaten; temp. at 3.30 p.m., 101.4°.
Feb. 13 ..	5 p.m.—Fed with 2 lb. leaves and 2 lb. chaff.	All eaten; scours and traces of blood.
Feb. 14 ..	6.30 a.m.—Fed with 2 lb. leaves and 2 lb. chaff.	All eaten; scours and traces of blood.
Feb. 14 ..	12 a.m.—Fed with 2 lb. leaves and 2 lb. chaff.	All eaten; scours and traces of blood.
Feb. 14 ..	5 p.m.—Fed with 2 lb. leaves and 2 lb. chaff.	All eaten; scours and traces of blood.
Feb. 15 ..	— No Tie bush available. Fed with chaff.	Condition slightly improved, and scours.
Feb. 16 ..	12 a.m.—Fed with 2 lb. leaves and 3 lb. chaff.	Slightly better.
Feb. 16 ..	5 p.m.—Fed with 2 lb. leaves and 3 lb. chaff.	All eaten; condition about same.
Feb. 17 ..	6.30 a.m.—Fed with 2 lb. leaves and 3 lb. chaff.	All eaten; condition about same.
Feb. 17 ..	12 a.m.—Fed with 2 lb. leaves and 3 lb. chaff.	All eaten; condition about same.
Feb. 17 ..	5 p.m.—Fed with 2 lb. leaves and 3 lb. chaff.	All eaten; condition about same.

Result.—Both animals very emaciated and badly scoured; no other symptoms.

BREAD FROM MAIZE AND SAUCE FROM CASSAVA.

Many years ago, when much of the flour required by farmers and others settled on the land in this State was imported from Chili and Adelaide, white maize was frequently used in conjunction with flour for bread-making. The maize was ground at Pettigrew's sawmills, and utilised for making porridge as well as for eking out the flour supplies.

Writing from Pomona (North Coast Line), a correspondent, under the pseudonym "Bush Bloke," says that, in view of the shortage of flour and abundance of maize, the following extract from Bell's "The Naturalist in Nicaragua" may prove of interest to many of our readers:—

"In Central America the bread made from maize is prepared at the present day exactly as was done in ancient Mexico. The grain is first boiled along with wood ashes or a little lime, the alkali having the effect of loosening the outer skin of the grain, which is then rubbed off in running water, a little at a time, placed upon a slightly concave stone called a 'melatl' (from the Aztec metlatl), on which it is rubbed with another stone, shaped like a rolling-pin. A little water is thrown on it as it is being bruised, and it is then formed into a paste. A ball of the paste is then taken and flattened out between the hands into a cake about 10 inches in diameter and three-sixteenths of an inch thick, which is baked on a slightly concave earthenware pan. The cakes so made are called 'tortillas,' and are very nutritious. When well made, and eaten warm, they are very palatable, and I preferred them to bread made from wheaten flour."

To those who have a patch of cassava, the following from Bates's "The Naturalist on the Amazons," may be of interest:—

"To these (fish), we used a sauce in the form of a yellow paste, quite new to me, called 'Arube,' which is made of the poisonous juice of the Mandioca (Cassava) root, boiled down before the starch or tapioca is precipitated, and seasoned with capsicum pepper. Several weeks before using, it is kept in stone bottles, and is a most appetising relish to fish."

General Notes.

LONDON MARKETS.

March 13.—Cotton, 25¾d. per lb; rubber (Para) 2s. 5½d., plantation 2s. 6¼d., smoked 2s. 6⅝d. per lb; copra, £67 per ton; sisal hemp, £60 per ton; linseed oil, £125 per ton.

PRICE OF PIGS.

At Toowoomba, on 19th March, 220 pigs were offered. Quotations were: Baconers, from £4 to £8, according to quality; porkers, £2 15s. to £4; stores, good, £2 10s. to £3 10s.; slips, 30s.; suckers, 15s. to 25s.

At Crow's Nest, on the same date, prices were as follows:—Baconers, £6 to £7 18s.; store pigs were keenly competed for, one vendor making £51 for 17 stores

NOTICE TO COTTON-GROWERS.

The attention of cotton-growers is drawn to the fact that some growers are consigning their cotton to this Department in one- or two-bag lots at frequent intervals, instead of waiting until a fairly reasonable load is forthcoming.

The time taken in carting from rail to store and the finding and clearing of same is often as great in the case of a single bag as, say, a dozen, and the cartage necessarily falls heavier on the small consignment.

This Department, in the interest of the cotton industry, includes cotton with other goods carted to this Office whenever possible in order to lessen the cost to the grower, but it sometimes happens that no other goods are offering and special trips have to be made.

It is also advisable to brand the bags before sending with your initials or stock brand and inform this Department by letter or postcard when it is being railed and how branded.

MULE WITH A FOAL.

In reply to a request from a Townsville inquirer for an instance of a mule having had a foal, the "Pastoral Review" of 16th February published the following, which appeared in an English paper a few years back:—

"A FERTILE MULE.

"Sir,—On 5th July I was called to examine a female mule with foal at foot. I was informed that it was her second, as last year she gave birth to a filly foal, which lived two months and died. The present one is a colt two months old, by a jack donkey, and somewhat resembles a young donkey, but bigger. The mule is six years old, 13.2½ high, and bay, with black points. No special marks or stripes, and a very good type of mule. I can only find out that she was bred from a she donkey, sire unknown. She is giving milk, and the foal suckled in my presence. The island is noted for its mules, and I certify that it is a genuine mule and foal.—G. J. Harvey, M.R.C.V.S., Government Veterinary Surgeon.

"Nicosia, Cyprus, 17th July."

DISEASE IN CAPSICUMS.

A sample plant of capsicums in which the fruit was nearly fully grown was brought to this office last week, and submitted to Mr. Hy. Tryon, Government Entomologist, for his opinion on a disease which had seriously affected all the pods, causing them to shrivel and finally die.

Mr. Tryon stated that he had a previous record of this fruit being one affected by the fruit-fly, but this contribution was of peculiar interest, as in most cases the injury resulted from punctures of some ovipositor, which had left its eggs in the pericarp, but in most cases, as in this, the fruit had already formed new tissue over that injured, in a manner similar to that which is found in the case of passion fruit.

THE TRAPPING SEASON.

A proclamation was gazetted on the 19th March, 1920, under the Native Animals Protection Acts, fixing the open season for opossums from 1st April to 30th June, 1920. No open season will be proclaimed for native bears, and these animals will remain totally protected. With regard to the use of cyanide of potassium, this has become so serious that further stringent regulations are about to be issued, especially regarding the sale of this poison, and holders of cyanide of potassium are warned that it will be inadvisable to sell this or any poison to persons reasonably suspected of requiring it for the purpose of killing native animals.

Answers to Correspondents.

DESTRUCTION OF WHITE ANTS.

In reply to a correspondent asking for a remedy against white ants attacking posts, Mr. J. C. Brünnich, Agricultural Chemist, advises:—"If the posts are not hollow, it is sufficient to clear away the soil from the posts to the depth of about 12 inches, and liberally sprinkle soil near the post with ordinary arsenic and fill up the hole again. If the posts are hollow, the posts will have to be bored to reach the hollow core and the arsenic can be put in by mixing it with water, or by making a solution by boiling the arsenic with an equal amount of washing soda. As a rule, solution is not required and the dry arsenic is found quite effective. At any place where the earth-covered tunnels in which the white ants work can be broken and a pinch of arsenic introduced, all the ants will be destroyed in a short time."

PREPARING CANDIED LEMON OR CITRON PEEL.

The fruit, when bright yellow, is picked and placed in barrels full of brine, and left for at least a month. The brine is renewed several times. The fruits are then taken from the barrels and boiled in fresh water to soften them. They are then cut in pieces, the seed is removed, and the fruit is again immersed in cold water, soon becoming of a greenish colour. After this it is placed in large earthen jars, covered with hot syrup, and allowed to stand about three weeks. During this time the strength of the syrup is gradually increased. The fruit is then put into boilers with crystallised sugar dissolved in a little water, and cooked, then allowed to cool, and boiled again until it will take up no more sugar. It is then dried and packed in wooden boxes.

CURING LEMONS.

REGINALD POOLE, Saltern Creek.—

A start should be made by picking a portion of the crop before it becomes too ripe—during the months of May, June, and July—and store such fruit away in a well-ventilated, dry, and cool building either in boxes or trays. It has been demonstrated that lemons keep best when pulled just as they are beginning to turn ripe. They are best picked when 2½ in. in diameter, even although almost green. They should be allowed to stand for a few days, and then packed away in paper-lined boxes or tins, or on trays, care being taken that none are bruised, for a bruised lemon is a spoilt lemon. The trays or boxes may be stacked in blocks in such a manner as to permit of a free circulation of air round each case. This is most important, as it allows any superfluous moisture to escape. The trays or boxes should be occasionally examined to remove any decaying fruit, say about every month or six weeks. In this way the fruit will keep for several months. The object in curing lemons is to reduce the thickness of the peel, and make it tough like a piece of kid glove, and to increase the juiciness. The colour will be intensified by this simple process.

COPRA-MAKING ON THE FARM. VINEGAR FROM MOLASSES.

"FARM," Gordonvale,—

In reply to your question concerning the making of copra on the farm on a small scale, this can easily be done as follows:—

Dry the kernels by means of the sun, having extracted the meat from the cracked nuts. Fire-dried copra is only fit for soap and candle making. The nuts must, of course, be ripe. Six thousand nuts will make 1 ton of copra, or, roughly, about three nuts to the pound. The kernels must be perfectly dried, otherwise a mould will set in—5 per cent. of moisture is all that can be allowed if mould is to be prevented.

After being halved, the nuts are placed in the sun, concave side up. The meat as it dries separates from the shell; the milk, of course, goes to waste on the soil. The operation takes about five days, unless rain should come on, when the kernels must be covered up at once or mould may set in.

In May, 1913, the cost of making copra in Queensland was about £18 per ton, one-third being the cost of upkeep of estates; one-third the cost of picking the nuts, transport to factory, husking, splitting, and removing the meat, drying the copra, bags, and bagging; the last third goes for transport to ship and freight. Were it not for labour troubles, the making, &c., of copra in Queensland should not exceed £15 per ton.

There are three methods employed in preparing copra. The most primitive in use in Papua and other islands, is by drying the kernels in the sun, either on the ground, on barbecues, or on drying racks and hurdles with provision for roofing in wet weather; secondly, on split bamboo hurdles, or on grills over fires; and thirdly, the artificial way of drying the kernels by means of hot air in ovens, or in buildings or rooms specially designed for the purpose.

VINEGAR FROM MOLASSES.

To 8 gallons of clear water, add 3 quarts of molasses; turn the mixture into a clean, light cask, shake it well two or three times, and add 3 spoonfuls of good yeast or two yeast cakes, place the cask in a warm spot, and in ten or fifteen days add a sheet of common wrapping paper, smeared with molasses and torn into narrow strips, and you will have good vinegar. The paper is necessary to form the "mother" or life of the vinegar.

You are quite right in what you say of clearing and rainfall. (See the "Queensland Agricultural Journal" for December, 1919, page 300.)

COTTON PICKING.

J. HOWARD, Woongarra, Bundaberg—

1. The greatest weight of cotton per bush in North Queensland (north of the Tropic of Capricorn) was gathered by Archdeacon Campbell on his cotton garden at Cairns. Weight, 21 lb.

2. A farmer on the Logan (south of the Tropic) claims to have gathered 20 lb. from a single bush.

At Capella, 170 miles inland from Rockhampton, just south of the Tropic, a farmer picked his whole crop at the rate of 28 lb. per hour.

In the United States white men have picked on an average 200 lb., and up to 400 lb. per day.

The best record for Queensland was 150 lb. per day, under ordinary conditions, per picker.

We shall be glad to receive the promised information regarding cotton culture.

Commenting on the practicability of utilising the method suggested of gathering the green pods from the field by mechanical means, Mr. Daniel Jones makes the following remarks:—

''The practice of utilising the green bolls in American plantations is one that has been in vogue for many years. It, however, has always been related to the harvesting of frosted bolls and the process is called 'Bollie picking.' Often the early frost in the plantations cuts the plant down, if an early one, thus doing damage to the unripened bolls. In order to minimise losses these 'bollies' are gathered by hand and paid for at the rate of 2s. 6d. per hundred pounds. They are then allowed to dry, and by means of machines called 'Bollie busters,' the fibre is removed and placed in a cotton gin and turned out in the ordinary way. In instances, the 'bollie' crop is large, particularly when a good season has forced an extra growth of cotton which has matured late and the frost has caught it ere the bolls have broken open.

''This danger in Queensland is not so imminent as in colder countries; the most that can happen in our coastal areas is that some of the immature pods may shrubs. I have often ripened bolls in the manner indicated with success and advantage when wanting specimens of seed or fibre on emergent occasions.

''As regards gathering the whole crop, as the article under review suggests, it may be of some value when raising the Upland types of cotton which are dwarfed and different in habit and character compared with our more robust perennial shrubs. I have often ripened bolls in the manner indicated with success and advantage when wanting specimens of seed or fibre on emergent occasions.

''To apply this system to our larger growing plants would be surrounded with difficulty, and would diminish the higher quality of the fibre by such rough treatment. No doubt some such method of dealing with Upland sorts, particularly in frosted districts, would enable growers to save some of their crop which otherwise would be lost.''

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1920.

Article		MARCH
		Prices
Arrowroot	ton	£60
Bacon	lb.	1s. 5d.
Barley	bush.	7s.
Bran	ton	£13
Broom Millet	,,	£40 to £60
Broom Millet (Sydney)	,,	£60 to £70
Butter (First Grade)	cwt.	200s. 8d.
Chaff, Lucerne	ton	£9 10s. to £17
Chaff, Mixed	..	...
Chaff, Oaten	,,	£11
Chaff, Wheaten	,,	£13
Cheese	lb.	1s.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 10½d.
Hay, Lucerne	ton	£13 10s.
Hay, Oaten	..	...
Honey	lb.	5d. to 7d.
Maize	bush.	8s. 6d. to 11s. 6½d.
Oats	,,	7s. 3d.
Onions	ton	£10 to £22
Peanuts	lb.	7d. to 10d.
Pollard	ton	£10
Potatoes	,,	£10 3s. to £14 10s.
Potatoes (Sweet)	,,	£13
Pumpkins (Cattle)	,,	£8 to £10
Eggs	doz.	2s. 7d. to 3s. 3d.
Fowls	per pair	8s. to 8s. 6d.
Ducks, English	,,	5s. to 6s.
Ducks, Muscovy	,,	5s. to 8s.
Geese	,,	10s. to 12s.
Turkeys (Hens)	,,	10s. to 15s.
Turkeys (Gobblers)	,,	20s. to 45s.
Wheat	bush.	8s. 3d.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	3s. to 12s.
Beetroot, per dozen bunches	9d. to 1s.
Cabbages, per dozen	3s. 6d. to 18s.
Carrots, per dozen bunches	1s. 9d. to 2s. 6d.
Chocos, per quarter-case	2s. to 3s.
Cucumbers, per dozen	3d. to 1s. 9d.
Lettuce, per dozen	9d. to 1s. 6d.
Marrows, per dozen	2s. 6d. to 7s. 6d.
Parsnips, per dozen bunches	1s. to 2s.
Peas, per sugar-bag	8s. to 18s.
Potatoes (Sweet), per sugar-bag	6s. to 8s.
Pumpkins (table), per sack	2s. 6d. to 11s. 6d
Tomatoes, per quarter-case	2s. 6d. to 7s. 6d.
Turnips (Swede), per sugar-bag	1s. 6d. to 2s. 3d.

SOUTHERN FRUIT MARKETS.

Article.	MARCH. Prices.
Bananas (Tweed River), per double-case	12s. to 21s. 6d.
Lemons, per bushel-case	14s.
Pineapples (Queens), per double-case	8s. to 14s.
Pineapples (Ripleys), per double-case	7s. to 12s.
Pineapples (Common), per double-case	7s. to 9s.
Oranges (Navel), per case	18s. to 20s.
Oranges (Other, Choice), per case	18s. to 20s.
Oranges (Second Crop), per case	4s. to 8s.
Tomatoes, per case	5s. to 9s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	5s. to 10s.
Apples, Cooking, per bushel-case	4s. to 9s.
Apricots, per quarter-case (Prime)	...
Apricots, per quarter-case (Small)	...
Bananas (Cavendish), per dozen	2d. to 8d.
Bananas (Sugar), per dozen	2d. to 6d.
Citrons, per cwt.	10s. to 14s.
Cocoanuts, per sack	£1 5s.
Grapes, per lb.	3d. to 8d.
Lemons (Lisbon), per half bushel-case	5s. 6d. to 7s. 6d.
Lemons (Rough), per cwt.	...
Mandarins, per case	13s. to 18s.
Limes, per half bushel-case	...
Mangoes, per bushel-case	2s. to 14s.
Nectarines, per quarter-case	...
Oranges (second crop), per quarter-case	3s. to 5s.
Oranges (inferior), per quarter-case	...
Papaw Apples, per quarter-case	1s. 6d. to 12s.
Passion Fruit, per quarter-case	2s. to 10s.
Peaches, per quarter-case	2s. to 8s. 6d.
Pears	8s. to 12s.
Persimmons, per quarter-case	2s. to 5s.
Pineapples (Rough), per dozen	3s. 6d. to 8s.
Pineapples (Smooth), per dozen	3s. 6d. to 8s.
Pineapples (Ripley), per case	3s. to 7s.
Plums, per quarter-case	8s. to 14s. 6d.
Rock melons, per dozen	...
Tomatoes (prime), per quarter-case	2s. 6d. to 7s. 6d.
Tomatoes (inferior), per quarter-case	2s. to 3s.
Water melons, per dozen	2s. to 5s.

TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1920.

Animal.	FEBRUARY. Prices.
Bullocks	£26 10s. to £40 15s.
Cows	£17 to £22 2s. 6d.
Merino Wethers	46s. 3d.
Crossbred Wethers	65s.
Merino Ewes	45s.
Crossbred Ewes	60s.
Lambs	58s.

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A tall, perennial, reed-like grass, growing to a height of 6 ft. Like most grasses with creeping roots, it is easily propagated by planting out, which is effected very sipmly by throwing roots into shallow water. With swamps that hold the water all the year round, it would be difficult to find a more suitable grass, for the amount of pasture it produces is extraordinary. Dairy Cattle are particularly fond of POA AQUATICA, and on Dairy Farms with swampy ground, considerable quantities have been established to great advantage. Cattle will walk right into the swamp, right up to their bellies, to get it. It not only affords rich pasturage in Summer, but forms the chief part of Winter Fodder, and will give immediate results in both Summer and Winter growth. Without doubt, one of the best feed grasses yet introduced. Only obtainable in roots, £2 per sack. **We are the Sole Distributors.**

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This new Oat grows to a height of 6 feet, and has yielded from 90 to 100 bushels to the acre. One grower reports very satisfactory results, obtaining 61 bushels in spite of a very dry season. Graded, re-machined, clipped, and tailed. 10/6 bushel; 9/6 bushel in sack lots; 9/- bushel in 5-sack lots; f.o.b. Melbourne.

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Extremely rust-resistant, and a very good cropper. Slightly grey in colour, the Oat is thin skinned, and of fine quality, the bushel weight—the true test of value—being 46 lbs. The heavy-weighing Oat has naturally a good kernel. Price, 10/6 bushel; 9/6 bushel in sack lots; 9/- bushel in 5-sack lots; f.o.b. Melbourne.

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Farm and Garden Notes for May.

FIELD.—During this month, the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the department from the growers, to whom an advance of not less than 4d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market, and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments and freight, if the cotton is exported, will be deducted. Thus it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass, notably Rhodes grass, will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta, Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

KITCHEN GARDEN.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, khol-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

FLOWER GARDEN.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, fresias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

THE SOUTHERN COAST DISTRICTS.

The advice given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed, the better they will carry, and the better the price they will realise.

Continue to pay careful attention to specking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit fly, and sweat the fruit carefully before packing. If this be done, there will be little fear of the fruit going bad in transit or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil; keep down undergrowths, and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated, what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring. Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later, that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done, it will probably be moist enough for planting; but should there have been a dry spell, then, when the hole has been dug and the trees set therein, and the roots just covered with fine top soil, 4 to 8 gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound, free, sandy loams that are naturally scrub soils, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting, the better. If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to be well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedlings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked—first, to retain moisture—and, secondly, to prevent injury from frost—as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure, or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place; but quickly acting manures should not be applied now.

THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, papaws, and granadillas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast Districts being equally applicable here.

THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district the growing of a crop of blue or grey field peas, or a crop of vetches between the trees in the older orchards, is recommended as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than 4 cwt. of phosphatic manure, such as Thomas's phosphate, or fine bonedust, per acre. The crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen, as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over-large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin in thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit, scabby, warty, or otherwise unsightly fruit is not suitable for peel, and trees producing such require cleaning or working over with a better variety, possibly both.

The remarks *re* other citrus fruit and the work of the orchard generally, made when dealing with the coast districts, apply equally well here, especially as regards handling the crop and keeping down pests.

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ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6 42	5·42	6·19	5·59	5 46
2	4·58	6·46	5·22	6·42	5·42	6·18	5·59	5·44
3	4·59	6·46	5·23	6·41	5·43	6·17	6·0	5·43
4	5·0	6·46	5·24	6·41	5·44	6·16	6·0	5·42
5	5·0	6·46	5·24	6·40	5·44	6·15	6·1	5·41
6	5·1	6·47	5·25	6·39	5·45	6·14	6·1	5·40
7	5·2	6·47	5·26	6·39	5·45	6·13	6·2	5 39
8	5·2	6·47	5·27	6·38	5·46	6·12	6·2	5·38
9	5·3	6·47	5·23	6·37	5·46	6·11	6 3	5 37
10	5·3	6·47	5·28	6·36	5·47	6·10	6·3	5·36
11	5·4	6·47	5·29	6·36	5·48	6·9	6·4	5·35
12	5·5	6·47	5·30	6 35	5·48	6·8	6·4	5 35
13	5·6	6·47	5·31	6·35	5·49	6·7	6·4	5·34
14	5·6	6·47	5·31	6·34	5·49	6·6	6·5	5·33
15	5·7	6·47	5 32	6·33	5·50	6·5	6·5	5 32
16	5·8	6·47	5 33	6·32	5·50	6·4	6·6	5 31
17	5·9	6·47	5·33	6·31	5 51	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·51	6·2	6·7	5·29
19	5·10	6·47	5 35	6·29	5 52	6·1	6·7	5·28
20	5·11	6·47	5·35	6·28	5·52	6 0	6·8	5·27
21	5·12	6·46	5·36	6 28	5·53	5·59	6 8	5 26
22	5·13	6·46	5·36	6·27	5·53	5·58	6·9	5·25
23	5·14	6·46	5·37	6·26	5·54	5·57	6·9	5 24
24	5·15	6·45	5·38	6·25	5·54	5 56	6 10	5·23
25	5·16	6·45	5·38	6·24	5·55	5·55	6·10	5·22
26	5·16	6·45	5·39	6·23	5·56	5·53	6·11	5·21
27	5·17	6 44	5·40	6 22	5 56	5·52	6·11	5 20
28	5·18	6·44	5·41	6 21	5 57	5·50	6·12	5·19
29	5·19	6·43	5·41	6·20	5·57	5·49	6 12	5·18
30	5·20	6·43	...	...	5·58	5·48	6·13	5·18
31	5·21	6·42	...	...	5·58	5·47	...	...

PHASES OF THE MOON.

The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical.

			H.	M.
6 Jan.	○	Full Moon	7	5 a.m.
13 ,,	☽	Last Quarter	10	9 a.m.
21 ,,	●	New Moon	3	27 p.m.
29 ,,	☾	First Quarter	1	38 a.m.

Perigee on 5th, Apogee on 17th. (An occultation of the planet Venus by the Moon will take place on the 17th. Unfortunately not visible in Australia.)

4 Feb.	○	Full Moon	6	42 p.m.
12 ,,	☽	Last Quarter	6	49 a.m.
20 ,,	●	New Moon	7	35 a.m.
27 ,,	☾	First Quarter	9	50 a.m.

Perigee on 2nd and 28th, Apogee on 13th

5 Mar.	○	Full Moon	7	13 a.m.
13 ,,	☽	Last Quarter	3	57 a.m.
20 ,,	●	New Moon	8	56 p.m.
27 ,,	☾	First Quarter	4	45 p.m.

Apogee on 12th, Perigee on 24th.

3 Apr.	○	Full Moon	8	55 p.m.
11 ,,	☽	Last Quarter	11	24 p.m.
19 ,,	●	New Moon	7	43 a.m.
25 ,,	☾	First Quarter	11	28 p.m.

Apogee on 9th, Perigee on 21st.

There will be no eclipse of the Sun or Moon till May 3rd.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

QUEENSLAND AGRICULTURAL JOURNAL

Vol. XIII. MAY, 1920. Part 5.

Agriculture.

ELEPHANT GRASS.

We have occasionally received inquiries as to the value of elephant grass as a fodder for stock. Lately a New South Wales farmer wrote to the ''Producers' Review,'' Brisbane, the following letter eulogising the plant as valuable fodder for the Downs. The matter was referred to the Director of Agriculture, Mr. H. C. Quodling, whose opinion on the so-called grass is attached.

The writer said:—''It is now some years since I introduced this famous grass from Rhodesia, South Africa, and I must say that it has exceeded my most sanguine expectations as a heavy-yielding, drought-resisting, and nutritious fodder. Although it is known to some slight extent in Queensland, much good may result to those who have not yet given it a trial by informing them about it. In its native home it reaches a height of 20 ft., but for fodder, when cultivated, it should be cut once every three months, giving a return each time of about 10 tons per acre. It is a very rapid grower, is relished by all classes of stock, and is said by analysts to be much richer than either green maize or cow cane. A South African authority says: 'The grass grows very rapidly and can be cut frequently, and is greatly relished by all classes of stock—horses, cattle, and pigs—which seem to prefer it to lucerne, paspalum, and other grasses tried here. It is also very fattening.' It is permanent when once established, and the tufts or stools increase rapidly in size. The plants should be grown 3 ft. apart in rows 6 ft. wide. It should prove a great boon to farmers on the Downs.''

Mr. Quodling, in reply:—''Elephant grass is a misnomer, in the sense that it is not adapted for grazing off like ordinary grass. It is a strong-growing, free-stooling plant, belonging to the same family as pearl millet. The crop is adapted for semi-tropical and tropical conditions more so than for temperate parts of the State, where frosts would adversely affect it. It is propagated from cuttings of the stem, similarly to sugar-cane; also from seed. Successive cuttings of fodder can be made during the growing season. As there are several excellent varieties of sorghums of approved value, I do not think there is any reason for advocating the growth of elephant grass with a view to excluding them, but the plant will fill a useful place.''

ELEPHANT OR NAPIER GRASS.

We have of late received several inquiries as to the value of Elephant Grass as a fodder plant for stock, and the consensus of opinion of the instructors in the Director of Agriculture's Department is decidedly adverse to it.

Mr. A. E. Gibson, Instructor in Agriculture, writes as follows on the subject:—

"Several inquiries having been directed to the Department of Agriculture on the subject of Elephant Grass, the opportunity is taken of giving readers of the 'Queensland Agricultural Journal' an idea of what this so-called 'grass' is really like. Compared with members of the sorghum family, it is an inferior fodder, but has, no doubt, the recommendation of being able to produce a certain amount of coarse material which can be used as stock food when other forage plants having a higher feeding value are scarce.

"The tops of the plant are succulent, but the lower portions become extremely hard, and are somewhat of the nature of bamboo when matured. The plants growing on Mr. Wilson's property easily reached 9 ft., whilst individual stalks would exceed this height.

PLATE 15.—ELEPHANT OR NAPIER GRASS, GROWN ON THE PROPERTY OF MR. C. R. WILSON, GLASSHOUSE MOUNTAINS.

"Mr. Wilson also cultivates a considerable amount of Guinea Grass (*P. maximum*), of which grass he holds a very high opinion, and states that for forage purposes in this district it is above all others, being a quick grower and providing heavy yields of good succulent material which readily lends itself to curing. This plant is usually propagated by division of the roots, owing to the difficulty of securing seed of good germinative quality, and if planted in a suitable situation in drills 3 ft. 6 in. to 4 ft. apart, and given proper cultivation, gives heavy yields.

"The plant stools remarkably and easily attains, under favourable conditions, a height of from 6 ft. to 8 ft."

The accompanying photograph of the so-called grass was taken on the farm of Mr. C. R. Wilson, Glasshouse Mountains, and clearly shows the characteristics described by Mr. Gibson.

TOBACCO CULTIVATION.

The high prices obtaining for tobacco-leaf should be encouragement for its more extensive cultivation. Manufacturers in this country and even in America experience difficulty in obtaining adequate supplies. The British-Australasian Tobacco Company are offering 2s. 6d. per lb. for bright lemon-colour leaf (flue-cured) pipe tobacco. First-grade cigar-leaf realises 2s. 6d. per lb. in the Melbourne auction mart, and no flue-curing is required. The average yield per acre is 1,000 lb. This has been improved upon in America, and in the Lancaster County (Penn.) 1 ton per acre of fine cigar-leaf is being obtained. Unfortunately, the Queensland grower is ignorant of these improved American methods, and generally the cultivation and curing are very backward. The industry is well protected; for instance, the duty on cigars is 10s. per lb., and on manufactured tobacco, plug, cut, leaf, cigarette, &c., 7s. 3d. per lb.

The output of leaf from the Bowen district varies from 20,000 lb. to 40,000 lb. per annum, according to the season experienced. The output of pipe tobacco leaf from the Texas district is about 60,000 lb. or 70,000 lb., mostly Chinese-grown. Australia's annual importation of cigar-leaf only from the United States of America alone is approximately 500,000 lb. It is therefore seen that there is ample scope for the tobacco planter in this country.

Tobacco, as a crop, requires skill and patience and constant care, but there is certainly no hard labour attached to it. Indeed, the greater half can be done by juvenile labour. Next to soil, a good shed, or ''tobacco house,'' is indispensable. It can be constructed very cheaply, but strict attention must be paid to dimensions, internal fittings, facilities for the exclusion of bad weather, proper ventilation, and the admission of the proper amount of light, &c. Unless the tobacco has been properly housed, bulked, conditioned, and cured, the result will be a dry, tasteless weed which will not find many lovers.

Almost without exception, a certain Spanish variety has been grown in the Bowen district for the last ten years. This variety is out of date, being unsuitable for cigar-wrapper (wrapper-leaf, first grade, fetches about 16s. per lb., by the way). Other varieties should be tried out, such as Pennsylvanian and other eastern American tobacco, Cuban, and Manila. This is mentioned to show how backward the industry is, and the great scope for improvement in the selection of suitable varieties alone.

Tobacco, even as a side line crop in localities where the soil and climate are suitable, should be worthy of the farmer's attention. It stands the dry weather well, and a farmer having 1 acre as a standby when other crops have failed would have something up his sleeve. While all the talk is going on about making Australia a self-contained country, here is tobacco, which ought to be a staple crop, practically receiving no encouragement.—NORMAN COBB, in the ''Producers' Review.''

DEVELOPING THE GROWING OF COTTON.

EMPIRE COTTON—REPORT OF THE BOARD OF TRADE COMMITTEE.

On the 25th July, 1917, a Committee, under the chairmanship of Sir Henry Birchenough, Bart., K.C.M.G., was appointed by the President of the Board of Trade ''to investigate the best means of developing the growing of cotton within the Empire, and to advise the Government as to the necessary measures to be taken for this purpose.'' It was a strong and representative Committee, consisting of twenty-one members appointed by the Board of Trade and seventeen members nominated by Government Departments, trade associations, and other public bodies. The recommendation that the Empire Cotton-growing Committee should be set up was made by the Departmental Committee on the Textile Trades, and this recommendation was supported by a Memorandum to the Prime Minister from the British Cotton-growing Association and other bodies, including the Liverpool and Manchester Cotton Associations, and all the Associations of employers and employed in the cotton industry.

It was pointed out that—

(1) The world is short of cotton, and the shortage is increasing.

(2) The shortage is greatest in the finer kinds of cotton which Great Britain uses so largely, and is generally more serious for Great Britain than for any other country.

(3) Eighty-five per cent. of the cotton used in Great Britain comes from the United States, which every year itself consumes more of its own cotton.

(4) The British Empire can (with proper development) grow the quantity and quality of cotton that it requires.

(5) Cotton-growing brings prosperity to the places suited for it.

It was also suggested that there was a wide sphere of work which needed to be done by someone, and which could only be done quickly with Government assistance. It was argued that it was the business of each colony or protectorate to decide for itself whether its climate, soil, population, and means of access to markets were suitable for cotton; also that it was the business of each colony to decide what kind of cotton it was most profitable to grow, to try experiments, to control the industry, and to provide the necessary transport and other facilities when cotton was shown to be profitable to the colony. Finally, it was suggested that great advantages would arise from the creation of some kind of central committee or department in the Imperial Government to advise and assist in connection with all measures which had to be taken, and, in particular, to bring all the resources of science into play to promote the extension and improvement of cotton-growing.

THE GENERAL SITUATION.

All the investigations that the Committee have made tend to confirm the statements made in this Memorandum. There is no doubt about the shortage of cotton, nor as to its importance to Great Britain and the British Empire. Since July, 1917, the situation has become decidedly worse. Owing in part to the necessity for growing more foodstuffs to meet the needs of the war, the cotton crops in the United States, in Egypt, and in India have been curtailed. Moreover, the seasons have been unfavourable, and the present season is giving rise to fears that the crops both in the United States and in Egypt will again be deficient. The advent of peace has in no way improved the situation. There is evidence of a world shortage of cotton goods, and there is no prospect whatever of there being a full supply of cotton for some years to come. Prices of cotton are already at levels far in excess of anything recorded since the cotton famine in the sixties. The Committee also find themselves able to endorse generally the opinions in the Memorandum. They are confident that if proper measures are taken, it should be possible to grow, within the Empire at any rate, a very large proportion of the cotton it requires. They are convinced that in many parts of the Empire cotton-growing will greatly increase the prosperity of the colonies which grow it. Further, they concur generally in the suggestions made in the Memorandum, and think it very necessary that the Committee should be empowered to advise and assist in all measures to be taken for the promotion of cotton-growing.

The Report of the Empire Cotton Inquiry Committee which has now been issued (Cmd. 523, 1s. 6d. net) is in two parts—Part I. giving the general views of the Committee, and setting forth general plans and proposals for the future; Part II., containing a detailed survey of the various territories of the Empire which are considered suitable for the cultivation of cotton. These countries include Egypt, the Sudan, Mesopotamia, Uganda, Nyasaland, Rhodesia, the Union of South Africa, Nigeria, and India. Under the heading "Cotton-growing—A Big Lancashire Scheme," the "London Times" of 7th April states that a scheme has been outlined in Lancashire for the creation of a great cotton-growing trust involving a trade levy to provide for the expenditure of many millions of pounds. Operatives and brokers, as well as manufacturers, have been invited to contribute to the trust. The chief source of the raw material has not yet been determined, but it is probable that it will be Nigeria.

It is, therefore, suggested that a fund should be raised on the basis of some kind of a levy from the cotton industry. A possible plan would be to impose a small sum on all cotton imported into the United Kingdom. So small a sum as 6d. per bale of 500 lb. would raise £100,000 per annum. Whatever plan is adopted, and whatever sum is found to be necessary, it will be trifling beside the interests involved.

Great Britain uses annually about 4,000,000 bales of cotton, valued at the present time at £150,000,000 and upwards. It is recognised that elasticity will be required, so that the sum annually provided may correspond with the expenditure which can, from time to time, be justified; and also that, so far as the industry provides funds, the bodies which find it must control its appropriation.—"Cotton," Official Journal of the Manchester Cotton Association, Limited.

A further report on this matter will be published by "Cotton," and will be reproduced in this Journal.

Referring to the above, we note that the only countries mentioned as probably most suitable for cotton cultivation within the British Empire are Africa and India. Northern Australia is not mentioned, presumably owing to the ingrained idea that cotton can only be grown profitably in countries where coloured labour is abundant.

We have only to look back a few years—say, to the date of the Civil War in the United States of America—to show that Queensland, without any coloured labour, supplied the British cotton mills with 10,643,771 lb. of raw cotton, of a value of

£443,490. That was in the eight years between 1866 and 1873. During that period the price of cotton in the British market was about 10d. per lb.

Many people fall into the error of thinking that the cessation of the bonus granted to exporters of cotton was the cause of the decline and final abandonment of the cotton industry in Queensland. This is quite a mistaken notion. The real reason for its abandonment was the tremendous fall in prices a year or two after the close of the American Civil War, when clean lint was only bringing 9 cents (4½d.) per lb. The Queensland farmer made satisfactory profits when he obtained from 1½d. to 2d. per lb. for his seed cotton sold to the proprietors of cotton ginneries in the colony, but it was manifestly impossible to grow cotton here in the face of such a small price in the British market; the farmers, therefore, gradually abandoned the business, but in 1915 there was strong evidence of a revival, especially as the Government erected ginning machinery, taking charge of all cotton sent to the gins, guaranteeing the grower a minimum price, and dividing all the profits of the sale of the finished article amongst the suppliers. For the past four years the latter have made good profits at no cost to themselves but picking and carting the produce or railing it to the Government ginnery. In 1919 growers received a clear 5½d. per lb., or, on an average, £22 18s. 4d. per acre, when the price of cotton in Liverpool was 11d. per lb. That price has now risen to 24¾d. per lb. and may go higher.—Ed. ''Q.A.J.''

We have now received the ''Journal of the Manchester Cotton Association'' for 6th March, from which we take the following article on ''Development of Cotton Growing,'' under the caption:—

''EMPIRE COTTON.

''LANCASHIRE MEMBERS AND STATE AID.

''The Lancashire Committee—that is, the whole body of Lancashire members of the House of Commons, irrespective of party—had their first real meeting this week. They dealt entirely with cotton, and mainly with the proposals of the Empire Cotton-growing Committee for extending the cultivation of cotton in the Empire. Letters were read from the Empire Cotton-growing Committee asking the Lancashire members to support the Lord Mayor of Manchester, on behalf of Lancashire, in asking the Prime Minister to receive a deputation to obtain the active assistance of the Government in carrying out the recommendations in the report of the Committee. The Government, through Sir Auckland Geddes, has agreed to contribute £10,000 a year for five years for research purposes. The Lancashire cotton trade, on its part, has promised to levy a voluntary tax upon itself of 6d. a bale, to raise £100,000 a year, as recommended in the report.

''The desire now is that the Government should grant an equal amount of £100,000 a year, to be applied to practical demonstration in cotton-growing in areas that may be selected, and that this shall not be for the advantage of any individuals or firms connected with the cotton trade, but for the special purpose of practical demonstration to the natives in the various possible cotton-growing areas in the best methods of making a commercial success of cotton-growing. The actual results of this, it is believed, would be a quicker development of the Empire, which would bring up the revenues of the various dependencies and ease the burden on the Treasury. The experience of the last seventeen years of the operations of the British Cotton-growing Association proves conclusively that the growth of cotton has enabled certain dependencies to become self-supporting, instead of being a charge on the British taxpayer. The proposed deputation will try to persuade the Prime Minister to take an active personal interest in work which is of so much national importance. If he agrees to receive a deputation it is to consist of representatives of all classes of trades in Lancashire, not merely of the cotton trade, and the representatives of local authorities and all the Lancashire members of Parliament.

''The meeting agreed to back up the Lord Mayor in his request to the Prime Minister, and a resolution to that effect was carried. Another resolution was passed appointing Sir John Harmood-Banner, Lieutenant Sugden, and Mr. Waddington to interview the Prime Minister on the matter.

''*Use of the Cotton Control Board's Great Surplus.*—Another subject discussed by the Lancashire members of Parliament was the proposed Cotton Mission to the Far East. It was reported, however, that that had already been satisfactorily dealt with, and that there would be no further charge upon the Treasury for the Mission. The Treasury are already giving £3,000, but the Mission is expected to cost about £12,000. The meeting were informed that the Cotton Control Board were going to find the balance of £9,000 out of the surplus fund in their hands. This surplus is a very large one, amounting to over £1,000,000; that is, representing an income of £40,000 or £50,000 a year. A scheme is before the Board of Trade at present for disposing of the money. The scheme includes grants for research and education connected with the cotton trade.

"The only other subject discussed at the meeting was the question of the grant of £6,000,000 given to the Sudan Government by the Home Government last year for irrigation south of Khartoum. It was resolved to ask the Government what progress had been made in this work, or if there proved to be no official information at present to ask the Government to obtain it."

At a meeting of the Manchester Branch of the Federation of British Industries in March last, Sir Henry Birchenough, chairman of the Empire Cotton-growing Committee, stated that "almost all the areas suitable for cotton-growing in the Empire, apart from Egypt and India, were in native occupation, and cultivation could only be rapidly extended if we were prepared to supply a large staff of trained white men to instruct and supervise the natives. The other point which had been criticised was that of finance. The industry had shown its willingness to submit to a levy of 6d. a bale, amounting to £100,000 a year. There was every reason to believe that the Colonial Governments would welcome and help the movement to develop cotton-growing in their territories. The British Government had agreed to grant £10,000 a year for office expenses. They had also put before the Cabinet a proposal for a large capital grant. He was sanguine that the grant would be secured, but any pressure which could be exercised from Lancashire would be helpful. The next step was the organisation of a body capable of making appropriate and effective use of the funds. A business like this could not be carried on by an amateur committee. He hoped they would be able to work in close co-operation with the British Cotton Growing Committee, or else to absorb it. Whatever body was set up could not cover the whole ground, and there would be ample room for commercial enterprise."

Were it not for the word "almost," we should be led into a possible error, by inferring that he intended to convey that all areas suitable for cotton-growing in the Empire were in native occupation. This is certainly not the case in Queensland, which extends from 10 to 28 south latitude, and where cotton can be grown on the vast extent of its coastlands. As for native occupation, these original possessors of the land are few and far between, and never have they been engaged in any other occupation but hunting until the white man came with his cattle and horses. Cultivation of the soil was not one of the occupations of the Australian blackfellow.

But that cotton can be, and has been, and is being grown to a profit from north to south has been proved years ago, and is being proved to-day. Why, then, should such a State as this be ignored by the Lancashire Committee? It has also been shown that no black labour is needed in Queensland, either for cotton-growing, or in the sugar-cane industry. Why then should one be led to infer that Queensland is included in the unsuitable lands for cotton-growing, and that all suitable lands are in the occupation of natives?

AUSTRALIAN FLAX IN ENGLAND.

The Victorian Department of Agriculture, in April last, received advice, through the Commonwealth Flax Committee, that the first consignment of 14 tons of Victorian flax fibre to be disposed of under open market conditions in England has realised the price of £325 per ton.

In previous issues of this Journal, we have published several articles dealing with the cultivation and preparation of this valuable fibre, the supply of which has never overtaken the demand, and at present is far below the requirements. In the January number, 1920, we republished an instructive letter on the subject by Mr. R. F. Strachan, Goondiwindi, to the "Brisbane Courier," to which we refer any of our readers who may feel interested in the possibilities of this crop.

Although several farmers on the Darling Downs sowed small areas of from 2 to 3 acres during this year, the dry weather during the growing season will doubtless have adversely affected the harvest, and, even were full crops obtained, there would still remain the disability of the want of a flaxmill. We have, in previous articles, shown how the flax-growers in the continental countries of Europe deal with their small crops by the use of primitive implements as described in this Journal for October, 1903, and in subsequent Journals.

A PROMISING NEW SYSTEM OF COTTON-PICKING.

With reference to the information on cotton-picking, supplied by Mr. Daniel Jones in the April number of the journal, the "Popular Mechanic's Magazine" of January, 1920, writes:—

"By the simple process of picking cotton in the boll, incubating the crop thus gathered, and there extracting the fibre by machine, the inventor of a new system promises a practical metamorphosis of the whole cotton industry. A 150,000 dollar (£30,000) plant already has proved the practicability of the idea. The success of the method rests on the discovery that cotton matures as much as three weeks before the hull opens, and actually deteriorates from the time the boll first cracks. Under the new plan the bolls are picked with considerable saving of labour when they begin to crack. The harvest of green bolls is then loaded into a machine, incubated in steam-heated chambers, and finally opened by simple mechanism. In 55 minutes or less, all the contained cotton is delivered ready for the gins. One machine unit produces one bale an hour requiring 20 h.p. to run, 20 lb. of steam, and two attendants. Cotton so picked is declared to be cleaner, brighter, stronger, and longer-fibred than the staple as handled at present."

MARKET GARDENING.

MANURING VEGETABLE CROPS.

Mr. J. C. Brünnich, Agricultural Chemist, replying to a correspondent asking for information on this matter, said: " 'Blood and bone' and basic superphosphates are totally different manures, as the former contains nitrogen and phosphoric acid; the latter, only phosphoric acid. A good all-round complete fertiliser for vegetables should contain from 8 to 10 per cent. phosphoric acid, 3 to 6 per cent. of nitrogen, and 2 to 3 per cent. of potash. If land is deficient in lime, apply crushed limestone or carbide waste."

For the information of those engaged in market gardening for pleasure or profit, the Department of Agriculture has issued a pamphlet on "Complete Fertilisers for Farm and Orchard."

REDUCING RAILWAY COSTS.

Owing to the universal rise in railway rates in the United Kingdom and elsewhere, increased attention is being given to reducing the bulk of goods transported. For this purpose, a baling-press is, in many cases, invaluable. The latest practice in this type of appliance is represented by a 200-ton electric press supplied to an Indian company for the baling of hides. Special provision is made for rapid and safe operation. In lowering the press, or raising light loads, the motor speeds up to 1,200 revolutions per minute, giving the press-table a very fast travel. When the load comes on, the motor automatically slows down, and exerts increasing pressure until the limit is reached. At that point, a switch automatically stops the motor. By means of an electro-magnetic disc brake on the motor shaft the pressure exerted can be maintained for an indefinite period. All the control is carried out by three press buttons. The current consumed in forming each bale is only one-eighth of a unit.—"Industrial Publicity Service," London.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1920.

The following are the results of the sixteenth egg-laying competition held at the Queensland Agricultural College, Gatton, which commenced on 3rd April, 1919. Owing to the Easter holidays it was necessary to disband most of the pens on 28th March. However, those pens marked (f) were allowed to complete the full year, and their records are given up to and including 2nd April. Mrs. R. Holmes's pen of Black Orpingtons, with a score of 1,619, has put up a record for the breed. Mr. R. Burns's E. bird has equalled the previous record, also held by Mr. Burns, of 335 eggs for the year, but it is to be regretted that this time, as on the previous occasion, the average weight of eggs was below the standard 2-oz. average.

The prizes are awarded as follows:—

Aggregate for Group of Six Hens.—Light breeds: 1st, J. M. Manson (f), 1,596; 2nd, E. A. Smith, 1,518; 3rd, W. Hindes, 1,477. Heavy breeds: 1st, R. Holmes (f), 1,619; 2nd, R. Burns (f) 1,541; 3rd, W. Smith, 1,406.

Single Hens.—Light breeds: B. Caswell, E. (f), 289; 2nd, J. M. Manson, O. (f), 286; 3rd, Dr. E. C. Jennings, F. (f), 280. Heavy breeds: 1st, Kelvin Poultry Farm, A. (f), 290; 2nd, Jas. Ferguson, B. (f), 278; 3rd, R. Holmes, A. (f), 274.

Winter Laying.—Light breeds: 1st, J. M. Manson, 488; 2nd, W. Hindes, 481; 3rd, Dixie Egg Plant, 466. Heavy breeds: 1st, R. Holmes, 544; 2nd, R. Burns, 469; 3rd, A. E. Walters, 452.

Those groups or individual hens shown with higher scores were disqualified because the average weight of eggs was under 2 oz. The following are the individual records:—

Competitors.	Breed.	March.	Total.
	LIGHT BREEDS.		
*T. Fanning	White Leghorns	138	1,627
*J. M. Manson	Do.	120	1,596
*E. A. Smith	Do.	110	1 518
*W. Hindes	Do.	104	1.477
*Dr. E. C. Jennings	Do.	111	1,431
*G. W. Hindes	Do.	109	1,403
*W. Becker	Do.	108	1,389
*Haden Poultry Farm	Do.	86	1,345
*Range Poultry Farm	Do.	73	1,335
*B. Caswell	Do.	74	1,322
*Quinn's Post Poultry Farm	Do.	63	1,317
*Dixie Egg Plant	Do.	49	1,315
*C. P. Buchanan	Do.	85	1,300
*Harold Fraser	Do.	77	1,289
S. McPherson	Do.	79	1,270

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	March.	Total.
	LIGHT BREEDS—*continued.*		
*W. Lyell	White Leghorn	97	1,268
J. H. Jones (Toowoomba)	Do.	65	1,264
W. A. Wilson	Do.	79	1,255
*L. G. Innes	Do.	54	1,234
*J. J. Davies	Do.	70	1,227
*Thos. Taylor	Do.	76	1,226
*Mrs. A. G. Kurth	Do.	69	1,219
*Mrs. L. F. Anderson	Do.	44	1,206
S. W. Rooney	Do.	55	1,183
G. J. Byrnes	Do.	55	1,183
Mrs. N. Charteris	Do.	92	1,180
J. Williams	Do.	45	1,141
N. A. Singer	Do.	92	1,131
G. Trapp	Do.	55	1,118
*Mrs. R. Hunter	Do.	47	1,113
*O. W. J. Whitman	Do.	70	1,111
H. A. Jones (Orallo)	Do.	64	1,107
C. A. Goos	Do.	54	1,075
B. Chester	Do.	51	1,067
Oakleigh Poultry Farm	Do.	67	1,062
H. O. Jones (Blackstone)	Do.	48	1,050
G. H. Kettle	Do.	37	1,026
J. W. Newton	Do.	48	1,020
R. C. J. Turner	Do.	59	1,008
J. H. Dunbar	Anconas	75	974
W. Morrissey	White Leghorns	46	933
	HEAVY BREEDS.		
*R. Holmes	Black Orpingtons	125	1,619
*E. F. Dennis	Do.	99	1,547
*R. Burns	Do.	123	1,541
*E. M. Larsen	Do.	83	1,420
*W. Smith	Do.	109	1,406
*A. E. Walters	Do.	76	1,380
*E. Morris	Do.	99	1,336
*Kelvin Poultry Farm	Plymouth Rocks	95	1,309
*Mars Poultry Farm	Black Orpingtons	87	1,271
Geo. Nutt	Do.	65	1,267
*T. Hindley	Do.	78	1,254
R. B. Sparrow	Do.	100	1,248
*Jas. Ferguson	Chinese Langshans	109	1,233
*Nobby Poultry Farm	Black Orpingtons	59	1,223
*A. Shanks	Do.	42	1,182
A. Homan	Do.	87	1,147
Burleigh Pens	Do.	84	1,141
*D. Fulton	Do.	46	1,132
*W. H. Reilly	Chinese Langshans	60	1,121
J. A. Cornwell	Black Orpingtons	84	1,083
*T. W. Leney	Do.	52	1,055
C. H. Singer	Do.	68	1,023
*H. Puff	Rhode Island Reds	48	1,001
A. Gaydon	Black Orpingtons	74	985
H. Ashworth	Do.	60	979
*T. B. Barber	Do.	48	953
Total	...	5,053	82,171

* Indicates that the pen is engaged in single hen test.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
T. Fanning (f)	269	254	267	287	266	284	1,627
J. M. Manson (f)	271	253	286	279	235	272	1,596
E. A. Smith	253	245	268	252	237	263	1,518
W. Hindes	260	258	256	225	228	250	1,477
Dr. Jennings (f)	246	221	236	231	217	280	1,431
G. W. Hindes	253	238	255	228	210	219	1,403
W. Becker	263	243	251	224	192	216	1,389
Haden Poultry Farm	257	240	233	216	176	223	1,345
Range Poultry Farm	207	234	243	240	200	211	1,335
B. Caswell (f)	178	171	213	256	289	215	1,322
Quinn's Post Poultry Farm	211	211	222	265	203	205	1,317
Dixie Egg Plant	203	222	235	202	217	236	1,315
C. P. Buchanan	178	255	188	221	218	240	1,300
H. Fraser	172	246	253	225	158	235	1,289
W. Lyell	204	232	238	198	210	186	1,268
L. G. Innes	149	247	170	210	245	213	1,234
J. J. Davies	213	220	218	177	193	206	1,227
Thos. Taylor	197	170	194	232	239	194	1,226
Mrs. A. G. Kurth	256	222	219	187	166	169	1,219
Mrs. L. F. Anderson	216	240	185	216	161	188	1,206
Mrs. R. Hunter	183	121	216	173	203	217	1,113
O. W J. Whitman	179	222	161	163	200	186	1,111

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Holmes (f)	274	272	299	242	317	215	1,619
E. F. Dennis	247	248	274	258	227	293	1,547
R. Burns (f)	270	224	246	335	247	219	1,541
E. M. Larsen	256	243	278	223	248	172	1,420
W. Smith	220	247	239	205	252	243	1,406
A. E. Walters	254	192	241	235	219	239	1,380
E. Morris	210	213	241	227	265	180	1,336
Kelvin Poultry Farm (f)	290	195	217	163	232	212	1,309
Mars Poultry Farm	198	249	246	185	170	223	1,271
T. Hindley	208	228	191	214	189	224	1,254
Jas. Ferguson (f)	210	278	171	175	206	193	1,233
Nobby Poultry Farm	175	191	179	196	231	251	1,223
A. Shanks	86	158	252	197	226	263	1,182
D. Fulton	172	193	187	170	191	219	1,132
W. H. Reilly	172	160	222	211	166	190	1,121
F. W. Leney	113	170	191	222	170	189	1,055
H. Puff	202	159	169	205	96	170	1,001
T. B. Barber	152	171	118	166	172	164	953

CUTHBERT POTTS,
Principal.

ELECTRICITY AND EGG-LAYING.

The "Journal of the National Society of Belgian Agriculturists" states that it is reported that a farmer in Indiana has succeeded in increasing the egg-laying power of his fowls by installing the electric light in his poultry-house from sundown to 10 p.m., and in the morning from 4 a.m. to daylight. This experiment is really not a new idea, as we remember that, about thirty years ago, a poultry farmer, in the French province of Liége, heated his poultry-house during the winter and illuminated it at dawn by means of petrol lamps. The fowls, being thus awakened, were immediately fed. The results of this treatment were, it appears, highly satisfactory. It can be understood that, by increasing the time of wakefulness, the birds are induced to feed to a larger extent, which results in a larger egg-production.

Now, at this time, when eggs are so dear, here we have an idea which it would be interesting to try in our country.

BIG MONEY IN MUSCOVY DUCKS.

By R. T. G. CAREY (Muscovy Breeder), Beerwah.

Are you aware that these aquatic fowls have more flesh upon their body than any other poultry, and that they eat less proportionately for the same weight of meat gained by a fowl? Are you also aware that the profits are of greater preponderance than those derived from any other of the feathered kingdom? Yet there are people who hold a contrary opinion, maintaining that the food consumption of the Muscovy is greater than the value returned. Let us prove the argument—"More meat; less food; greater profit"—which may seem a lying fallacy; nevertheless it is a felicitous lie! But breeders know otherwise, and it is upon such a weak presumption, or it is the wrong idea, wherein the public err.

Let an intending breeder secure a pen of Muscovy ducklings (drakes preferably)—about a dozen, say, just one month old; place them in a small enclosure, termed a pen; feed four times per diem, all that they can eat clean up (remove the uneaten food) at each meal. Watch the marvellous progress, the rapid growth, in the short space of twelve to fourteen weeks, the size, the weight of those drakes, weighing 12-14 lb. each, or a gain of 1 lb. of flesh per week; then that prospective investigator will be astounded. Assuredly, for each pound weight gained by the drakes, the cost in food consumption is less, for the weight so gained. Duck flesh, as a rule, is generally purchased in the markets, from 6d. to 8d. per lb. Therefore, in the short space of twelve to fourteen weeks of growth there is, approximately, 156 lb. of good duck flesh—a weight not gained by any other animated creature—pig, ox, goat, or lamb—representing a value of £5 4s., at 8d. per lb. The food consumed for each pound raised may be £2 5s. 6d., or 3½d. per lb.; the profit, therefore, is about £2 18s. 6d., or 51 per cent. above the cost of rearing a dozen drakes to maturity.

Anyone desirous of trying the above experiment to minimise the butcher's bill can, without much inconvenience, do so with the help of those handsome aquatic fowls. If unable to breed them, one can purchase them in quantities that suit one's requirements. Much of the family table offal contributes the greater part of their upkeep, which lessens the cost, and with a proportion of bran, pollard, maizemeal, and beef scraps added, will constitute their chief diet. Try the experiment for a season; learn how to relish the juicy Muscovy duck-meat with green peas, and the trial must convince him or her how remunerative this proposition may prove.

The sceptical venturer fears that the idea above suggested is too alluring, and the task of managing a few Muscovy ducks in a pen rather disheartening, because of the monotonous routine of attending to their daily requirements. But let that duty be performed by some enthusiast, who profits by their want of zeal, although believing the doctrine of "everything in nature is ordered for the best," and that it is best for others to perform the breeding and rearing of Muscovy ducks so long as their requisition bill can be supplied at short notice.

Pessimistically, many entertain the idea that those titanic waterfowls are not worth the attention, looking upon them as a pest, ever ready to decry the Muscovy duck as a docile, lazy, and quackless bird, and will have nothing to do with the rearing or breeding of them—until, alas! seized with the hen-fever—or "Muscovy mania! (Is that it?)—they launch into the duck-breeding business with such zeal and energy that friends are astonished at their enthusiasm, having realised the value of the Muscovy's potentialities as a white meat producer, &c., they feverishly erect quarters, feedroom, and nurseries for the propagating of those gigantic aquatic fowls. What a change! What an alteration in the home circle, every member of the family having to attend to the requirements of the Muscovies, nothing is neglected, while they are leaving something of the monotonous jobs that fall to poultry-raising, and which are, nevertheless, performed with all the zeal and thoroughness that characterise the work of Muscovy duck-breeding.

[The foregoing article on "Muscovy Ducks" will close the series of excellent papers on all that concerns this class of poultry, for which our thanks are due to Mr. R. T. G. Carey, of Pindora Poultry Farm, Beerwah. Mr. Carey has long made a study of the Muscovy duck, from the egg to the block, and his lessons on its treatment have been much appreciated by readers of the Poultry Section of the "Queensland Agricultural Journal."—EDITOR "Q.A.J."].

CHICKEN-POX OR WARTS.

By D. WALLACE, Rocklea.

Chicken-pox may be said to be endemic in Queensland. Fortunate is the poultryman whose young stock of the previous season's hatch do not contract it in the autumn—fortunate because in spite of early hatching and skilful rearing an autumn visitation of the malady, however slight, is an almost certain thing.

It revives each season at a time when eggs show a very appreciable increase on the past summer's prices. Not infrequently it runs through a whole flock of pullets, inevitably seriously reducing and even almost wholly suspending the egg yield at a time when the more favourable prices bring substantial relief and compensation for a previous period of slackness; also, the sale of stock is interfered with until the disease has disappeared.

The financial loss resulting from this disease throughout the Commonwealth each season would provide a surprise if figures were available.

Birds twelve months old or over are practically immune to it unless in close contact with infected young stock. In addition to this, the following conditions in connection with the diesase are conspicuous:—

Late-hatched chickens take it more readily and more severely, early-hatched birds being easily protected, at least against a severe form of the trouble, by treatment to be described hereafter.

Roup frequently accompanies it, though a distinctly different disease, and is not necessarily a concomitant condition.

Dampness is a condition favourable to the contraction and spread of warts particularly in the autumn. In yards where cockerels are penned in a limited area and are denied range and green feed they are the first of the flock to contract it.

It is highly infectious by mere contact.

It is not necessarily fly- or mosquito- borne, birds in gauzed coops being readily infected if kept in the vicinity of infected birds.

Little or nothing has been done by bacteriologists in the way of investigating the causation of this disease beyond ascertaining whether there was any connection between it and human "chicken pox." This was done in California; and when it was found that the two were not identical, the matter was dropped. At the time the enormous expansion of the poultry industry could not have been foreseen.

The causal organism is unknown, but apparently its growth is favoured by moisture and warmth, the high bodily temperature of a fowl (as high as 107 degrees in a healthy bird) being particularly suitable to it. With the approach of cold weather, it soon loses virulence. Like smallpox in human beings, one attack confers immunity against any subsequent attack. The pustular eruptions resemble those of smallpox though they have no foul smell, and the extremely high infectivity is much the same. Like the causal agent of smallpox, that of chicken pox is probably also a filter pass. It cannot be said to be evanescent for if allowed to remain in a flock, it acquires great virulence and becomes most persistent.

Chicken pox varies in virulence under varying climatic and geographical conditions. In China, for instance, I have seen it so virulent as to appear on chickens' toes and leave scars and depressions on the face and base of beak. In that country it is very fatal on a low, damp soil. Ostertag states:—The infection begins in the mucous lining of the mouth, and spreads to the outer parts of the bird's head. The fact that mucous is freely shaken from an otherwise apparently healthy bird's mouth a day or so prior to the appearance on the featherless portions of the head of small white blisters, which develop into ulcers, would appear to lend colour to the idea.

Possibly, like the normally harmless pneumococcus in the human saliva, the causal organism of warts becomes pathogenic under certain conditions, and produces chicken pox, as the pneumococci do pneumonia. Great depression and a marked lowering of the bird's vitality accompany the disease, and this in itself gives the youngster a tremendous set-back. Bird after bird contracts it, and the whole flock mope about partly or wholly unable to see, their heads a mass of loathsome sores. The poultry-man is kept busy doctoring them, with nothing coming in for eggs to add to his worries.

What really matters in an outbreak of warts is the great liability of the birds to contract roup. On top of roup, if not promptly and successfully treated, come pneumonia, bronchitis ("throat rattles"), and "roup eye," a form of conjunctivitis which may keep a bird blind and useless for weeks.

The incubation period of warts is from four to eight days, according to virulence and the condition of the flock. When the disease is prevalent, all new birds should be quarantined for at least eight days before being allowed to mingle with one's flock.

By "incubation period" is meant, not the duration of the disease, but the time that elapses between the moment of infection and the first manifestations of the malady.

Prevention and treatment will be dealt with in a following contribution.

Dairying.

THE MANUFACTURE OF CHEDDAR CHEESE.

By R. B. TENNENT, N.D.D.

PRELIMINARY CONSIDERATIONS.

To produce a really high-grade Cheddar cheese, it is first of all essential that the milk should be of the best quality, free from taints or manurial contamination. The two chief faults found with milk when delivered at the cheese factory are, firstly, too much acidity, and secondly, pollution with foreign matter such as hairs, straw, dung, &c. Although all first-class makers of Cheddars fully realise the importance of manufacturing from a clean, pure, sound milk, it is unfortunately true that the farmer as a rule does not sufficiently realise how much the flavour and keeping qualities of the cheese depend on the initial purity of the milk. One of the methods by which the average quality of cheese made in this State can be most rapidly improved is by the strict observance on the part of the farmer of scrupulous cleanliness in the production and handling of cheese milk; and if he is shown how he will profit financially by helping to put a really high-class cheese on the market, commanding a high price, the incentive for him to observe cleanliness will be greatly increased. It should, therefore, be the aim of every cheese-factory manager to inculcate the suppliers with the need of hygienic milk-production, and impress upon them the benefits accruing from such a practice.

Milk from cows suffering with hereditary or contagious diseases—such as tuberculosis, cow-pox, or mastitis—should never be used for cheesemaking, and, above all, the animals should have sound, healthy udders. The milk of one cow infected with chronic mastitis might easily contaminate a whole batch of milk, and so introduce unexpected difficulties in the process of manufacture, rendering the production of a high-class article impossible. This is a real source of faulty cheese.

Cheesemaking will reveal any abnormality in the milk more surely than any other test; therefore, milk which is in any way abnormal should not be used. Colostrum, or the milk of the newly calved cows, should never be mixed with the cheese milk, the presence of even a small quantity of it being inimical; nor is it advisable to use the imlk of sick or fevered cows, cows far gone in lactation, or cows in sexual heat.

It should be remembered that highly flavoured foods often impart their distinctive flavour to the milk, and this is usually retained in the cheese. To prevent such an undesirable occurrence, foods which tend to taint the milk should be avoided. All fermented foods, or foods which are partly decomposed, should not be employed. The feeding of cows during the milking process should also be avoided, for when straw or hay is carried through the milking-shed, the air becomes dusty, and thereby increases the number of germs that find their way into the milk bucket.

The flanks of the cows should be kept free from manure, and prior to milking the udder and teats should be moistened with a damp cloth. The milkers should be personally clean, and should wash their hands before milking each cow. The foremilk which is highly contaminated should be rejected, and the use of hooded buckets is strongly recommended, as it reduces the initial contamination by nearly 60 per cent. As soon as the milk is withdrawn from the cow, it should be removed from the milking-shed to the milkroom, and there strained, preferably through an absorbent cotton filter. All utensils coming into contact with the milk should be kept scxupulously clean. (*N.B.*—See writer's article, "A Clean Milk Supply," in April (1920) issue of the Journal.) Attention to these points are of real importance in cheesemaking, and neglect of any of them will assuredly lower the quality of the produce.

PROCESS OF MANUFACTURE.

TREATMENT OF EVENING AND MORNING MILK.

Milk should be delivered to the factory twice daily—*i.e.*, after the morning milking and after the evening milking. The evening's milk, after having been received, weighed, sampled, and run into the vat, should be immediately cooled to a temperature of from 68 degrees to 70 degrees Fahr., depending on weather conditions and season. The usual way is to run the milk over a cooler, or to circulate cold water in the jacket of the vat, stirring the milk at the same time. In very hot weather, where water is plentiful, the usual method is to leave it running in the jacket overnight. In winter, when the temperature of the milk falls quickly, it should be aerated, but not cooled. The whole object in cooling the evening's milk is to get rid of any animal taint and to reduce it to such a temperature as will be suitable for the *slow* development of the desirable lactic acid organisms which are invariably present in properly handled milk.

It is the custom with some cheesemakers to add a few drops of starter to the evening's milk, and where cheese has shown a tendency to be slow, or where undesirable fermentation has been troublesome, this practice is to be confidently recommended. Great care, however, must be exercised, a few drops only being added to the vat, otherwise a fast cheese will result. It should be remembered that when starter is added in the evening, less than the usual amount will be required in the morning.

In the morning the cheesemaker should take the temperature of the evening's milk, and in this way an indication of the development of acid is obtained. Whenever the temperature is over 70 degrees Fahr. less starter should be added, and the development of acidity during the ripening process must be carefully watched.

The cream is then skimmed off and returned to the vat through a cheesecloth, being thoroughly mixed with the milk. In winter it is advisable to heat the cream to 90 degrees Fahr. before returning it to the vat, thus ensuring a thorough distribution of the fat.

If there is cold water in the jacket of the vat, it is now run off and the milk is raised usually to 80 degrees Fahr. before the addition of the morning milk.

ADDING THE STARTER.

The starter is then added, and it is a common practice with some cheesemakers to add it to the skimmed cream before returning the latter to the vat. If this is done, care must be taken to avoid heating the cream to more than 100 degrees Fahr., otherwise the starter will be rendered practically useless. The quantity of starter used depends on the season, type of cheese made (whether slow or fast), and on the condition of the milk. In this matter the cheesemaker must be guided by the record of the previous day's cheese. The general rule being to add the smallest quantity of starter that will give a normally working cheese; that is, one in which the making process occupies from seven to eight hours. As an indication, it is usual to add from ½ to 1 per cent.—*i.e.*, 1 lb. of starter to 20 gallons of milk on the average. In winter the quantity should be increased owing to the slower development of acidity. It is better to add an under-quantity than an over-quantity; for, in the former case, the only disadvantage will be a longer period in the making process, whereas if too much starter is added the time of making will be short, acid will form too rapidly, with the result that the cured cheese will have a dry body and a short, brittle texture.

MANAGEMENT OF STARTER.

The two most important characterists of a starter are purity and vigour. A vigorous starter regulates the rate of acid production in the curd, which thus governs the time of making, and in addition controls or suppresses any abnormal fermentations in the cheese milk, this latter being a most important factor. The purity of the starter greatly influences the ultimate flavour of the cheese, for an impure starter, no matter how vigorous, cannot impart the fine flavour which is so characteristic of a good Cheddar cheese. It should be realised by the cheesemaker that the object of using a starter is not to shorten the making period, but to suppress abnormal fermentations and impart a first-class flavour to the finished article.

Starter is at present put on the market in powder form, and, although very convenient, requires a certain amount of technical skill in preparation. It is much better to procure starter in a liquid form from the Stock Experiment Station, Yeerongpilly, where it is sold in sealed bottles at 1s. 6d. per bottle of approximately 4 oz. Instructions on the preparation of a starter from these cultures accompanies each bottle.

It is important that fresh starter should be made each day from pasteurised milk, and it should be in a soft, creamy condition when ready for use. It is best kept in an enamel bucket, which must be thoroughly scalded before use, and kept covered with a clean muslin cloth. Excess of acid production greatly weakens the power of a starter, therefore it should not be allowed to become overripe. If it so happens that the starter becomes too thick, it should be cooled down, and some pasteurised milk added. Exposure to direct sunlight is detrimental, and is to be avoided. A good starter will ripen in from six to eight hours, and has a pleasant, clean, acid taste, free from any bitterness. If a starter becomes gassy and loses its vigour it should be replaced by a new one, and it is to be remembered that vigour alone is of little value unless accompanied by that other essential quality—purity.

RIPENING THE MILK.

The morning's milk is run into the vat after the starter has been added and the contents raised to the renneting temperature of 84 degrees Fahr. by the use of the steampipe connection. The milk is now allowed to ripen, an occasional stirring being given to maintain a uniform temperature and equal distribution of fat. The factors which determine the length of time required for ripening depend chiefly on the amount of acid formed overnight in the evening milk, the vigour and kind of starter, the quality of the cheese milk, and the type of cheese required. The average length of time is two hours from the addition of the starter, or one hour from the time the last morning milk was added to the vat.

In Australia the demand for uncoloured cheese is small, therefore most Cheddars made in this country are coloured with annatto, which is added during the ripening period, generally about a quarter of an hour before adding the rennet. It must be thoroughly mixed with the milk, otherwise unsightly coloured streaks will show in the finished cheese. The usual amount added is 2 oz. of annatto to 100 gallons of milk. To ensure thorough distribution throughout the milk the colouring matter may be diluted with five or six times its volume of water.

Rennet is added when the milk is considered ripe, and it is at this stage that many cheesemakers go wrong. Some makers estimate the degree of ripeness by the sense of smell; a few rely on the gift of imagination. The "rennet test" should be employed by cheesemakers to ascertain if the milk is in ripe condition for renneting. This test is simple, 4 oz. of milk being taken from the vat at 86 degrees Fahr., and to this is added 1 dr. rennet contained in a cup. The contents are immediately vigorously stirred with a teaspoon for five seconds. A few small pieces of cork are then dropped on to the surface of the rotating milk, and the number of seconds that elapse between the addition of the rennet and the cessation of movement of the floating cork gives the rennet test. The temperature of the milk must be 86 degrees Fahr. when the rennet is added; the rennet must be carefully measured, and the seconds carefully noted. For this latter purpose a stop-watch is very handy. In the case of new milk the rennet test is usually about 25 to 26 seconds; in milk ready for renneting, the rennet test should be approximately 21 to 22 seconds.

The "acidimeter test" is also largely used in this country, and in skilful hands gives excellent results. It should not, however, be used in preference to the "rennet test." The acidimeter consists of a graduated burette containing a solution of caustic soda of a known strength, which is allowed to drop, with constant stirring, into 1 oz. of the milk or whey, containing 2 or 3 drops of phenol phthalein, which acts as an indicator. The action of the caustic soda is to neutralise the acid in the milk or whey, and when this is done a faint permanent pink colour is apparent. The acidity test should be applied as soon as the morning's milk is added to that of the evening.

When the acidimeter records a rise of .02 over that obtained on the addition of the morning milk it is usually ready for renneting—*e.g.*, if the acidity of the mixed milk is .20 per cent., then the rennet may be added when the acidimeter reads .22 per cent.

RENNETING.

The rennet is added when the milk has attained the proper degree of acidity, and the quantity used when a standard commercial brand is employed is on an average 1 oz. to 20 gallons.

The rennet used must be above suspicion, free from turbidity or bad smell, and in storing it care should be taken to keep it in dark jars away from sunlight.

It is better to add the rennet too soon than too late. If added too soon, the time of coagulation will be prolonged, and the cheese will be slow; if added too late, a considerable amount of acidity will have formed in the milk, coagulation will take place in a short time, and the cheese will be too fast.

In adding the rennet to the milk it should be diluted with five to six times its volume of cold water, poured evenly over the surface and thoroughly mixed with the milk by stirring. Stirring for five minutes is usually sufficient, after which the vat should be covered with a clean white cloth, and the milk allowed to coagulate. Coagulation takes place in about forty minutes.

CUTTING THE CURD.

The curd is ready for cutting when it splits cleanly over the finger, or comes away clean from the side of the vat when the back of the hand is pressed on the curd surface. American knives are used, the curd being cut first with the vertical knife, lengthwise and crosswise, and then with the horizontal knife in the same manner. In cutting, the knives should be held perpendicularly; jarring and smashing the curd at the end of each stroke is to be avoided, also overlapping the previous cutting. When properly cut the little cubes will be of a uniform size, and the whey will be of a pale-greenish colour. If the curd has been cut too soft, or if roughly handled, there will be a loss of fat in the whey, which will be of a white colour. The amount of fat in whey should not exceed 0.3 per cent,; with judicious treatment this may be reduced to 0.2 per cent.

An acidimeter reading should be taken as soon as the curd is cut, and this reading will usually be .13 to .14 per cent. If much higher, then most probably the cheese will be fast, consequently careful supervision will be required during the scalding process, and especially after it has settled in the whey.

When the cutting is completed, the curd is hand stirred until firm enough to allow the rake to be freely used. Hand stirring usually occupies about ten minutes.

SCALDING OR COOKING THE CURD.

At this stage the scalding or cooking process commences, and by this is simply meant that the curd is slowly heated to a temperature higher than that of renneting. The object of scalding is to firm the curd and to simultaneously assist in the expulsion of moisture. The rate of heating and maximum temperature attained are points of utmost importance. The aim of the cheesemaker should be to reach the maximum temperature within an hour after the cutting of the curd, and to do this the temperature should be raised 1 degree in every 3 to 4 minutes. Moisture is more slowly expelled from the curd below a temperature of 90 degrees Fahr. than above, therefore heat slowly at first. The maximum temperature to scald should be 99 degrees Fahr. in summer and 101 degrees Fahr. in winter. It should be noted that some milks require a higher scald than others to secure the same degree of firmness.

The curd must be continuously stirred throughout the scalding process, care being taken to see that the particles do not mat or collect in the corners of the vat. Stirring is continued until the curd is ready to be settled or pitched.

SETTLING OR PITCHING THE CURD.

When the particles become firm enough, the curd is pitched or settled in the whey. This stage can be estimated by taking a handful of curd, squeezing it in the hand, and if it shows little tendency to cohere it is ready for settling. At this stage the acidimeter reading is normally .15 per cent. to .16 per cent. If higher, the curd is coming on quickly and requires watching. The curd is now allowed to lie ''cooking'' in the bottom of the vat, until the requisite degree of acidity has developed, and this usually occupies about one hour. If much longer, the cheese is said to be slow.

RUNNING THE WHEY.

This is one of the most critical steps in the whole process, for if the whey is run before the curd has developed the proper degree of acidity, too much moisture will be retained, and the cured cheese will probably go sour. The texture will tend to be soft and pasty, and the cheese may go out of shape in the curing room. When the whey is run off too late, although the flavour may be quite fair, the texture will be short and brittle.

The ''hot-iron test'' is the best method for ascertaining when to run the whey, but unfortunately it is not in general use. The testing iron is a flat bar of mild steel, about 20 in. long and 1 in. broad, fitted with a wooden handle. To make the test, a small portion of the curd is taken from the foot of the vat and firmly pressed for a few seconds in the hand to expel the whey. It is then applied to the iron, which has previously been heated to a dull black heat, until it adheres, and then gently withdrawn. The curd will draw into threads, if a certain degree of acidity has developed, the length and nature of those threads corresponding closely to the acidity of the curd.

When fine, silky threads, ⅛ in. to ¼ in. long, are observed, the whey is run. If the threads are shorter than this and very thick, it is an indication that the curd is still too sweet, and requires a longer time ''cooking'' in the whey. To conduct the hot-iron test properly, the iron must not be too hot nor too cold. A little practice will enable the cheesemaker to become proficient in the use of the hot-iron.

The acidimeter reading of the whey at this stage is from .23 per cent. to .25 per cent., and should always be taken to confirm the hot-iron test. The curd will now have contracted from the vat by about 3 in.

Where a large quantity of milk is being used, it is usual to run off some of the whey in advance. This in no way brings on the acidity, as is commonly believed, but is of advantage in large factories, especially if the cheese is fast.

CHEDDARING THE CURD.

As soon as the whey is run off, the curd is allowed to drain. If too moist, gentle hand-stirring for about three minutes is to be recommended, but there is a chance of loss of fat if this is done too vigorously. The curd when sufficiently dry should be evenly piled along the two sides of the vat, leaving an open channel down the centre to facilitate drainage. The vat at this stage should be tilted to allow the drainings to escape. Up to this stage the curd should not be allowed to become lumpy, the small pieces being as far as possible kept separate.

As soon as the curd has become matted, which takes place in about twenty minutes, it should be cut into blocks about 8 in. wide and turned over, the top going on the bottom. After draining about fifteen minutes the blocks are piled into layers two deep, each time the upper part being turned down. This is done every fifteen minutes until the operation is completed. Care should be taken to keep the curd well covered up, and not to allow the upper surfaces to become exposed to the air or to be chilled.

As a result of this cheddaring process, the curd develops a marked leafy or foliated texture—"it tears like meat on the breast of a chicken"; and this process is regarded as complete when (1) the curd forms strings on the hot-iron an inch to an inch and a-half in length, and (2) the whey running from the curd shows an acidity of from .70 to .90 per cent. The time occupied by the cheddaring process is usually from one and a-quarter to one and a-half hours, varying according to the development of acidity and texture of the curd mass.

MILLING THE CURD.

The objects of milling are to cut the curd into small pieces of uniform size, to facilitate salting, and to permit the escape of more whey. The curd at this stage should have lost all trace of harshness, being smooth and mellow. It also tears easily into thin strips. After milling, the curd is well stirred and freely exposed to the fresh air. At this stage an excellent opportunity is afforded for the escape of gases and undesirable flavours, and, after having been well stirred with the rake for about five minutes, it is brought together and allowed to lie until ready for salting.

SALTING THE CURD.

The hot-iron test is now 1½ in. to 1¾ in., and the threads are very fine and silky. The curd, when applied to the iron, smells like toasted cheese. When the salt is added the temperature is usually 78 degrees Fahr. to 80 degrees Fahr. Cheddars are salted at the rate of 1 lb. of salt to every 50 lb. of curd, but for a quick-ripening cheese rather less is required. In applying the salt, it should be sprinkled evenly over the curd, and the curd well stirred for ten minutes. Before hooping, fifteen to twenty minutes must be allowed to elapse for the curd to absorb the salt. The addition of salt to the curd reduces the temperature several degrees. The salt used must be clean, pure, readily soluble, and sharp in the grain. A very fine salt is not altogether desirable.

HOOPING AND PRESSING CURD.

Before filling the hoops, they should be well scalded and dried. Care is to be exercised in fixing the bandages, and to do this properly a certain amount of practice is necessary. A cotton cloth cap is wrung out in warm water and placed in the bottom of the hoop. The bandage is then put in the hoop, with the bottom edge turned in evenly about 1 in. The hoop is then filled with a weighed amount of curd, care being used to see that too much curd is not put in. A cap cloth is then placed on top of the curd, and then the ring and a wooden follower.

When the filled hoop is put in the gang-press in normal condition, a moderate pressure should be sufficient to cement the pieces of curd together in a smooth, solid body. The pressure should be applied lightly at first, gradually increasing until full pressure is reached in about half an hour. The pressure should be uniform and continuous for twenty-four hours.

DRESSING THE CHEESE.

When the curd has been in the press for about an hour, it should be in a fit state for dressing. The hoop is taken from the press and placed on a convenient dressing-bench. The bandage is now pulled up, made free from creases, and carefully cut to about an inch on each end with a knife. A well-starched cotton cap is now placed on each end, and over these a cotton cloth, the cheese being returned to the press under pressure.

On the following morning the hoop should again be removed from the press, and the cheese examined for any imperfections in bandaging and finish. These, if existing, should be remedied, and the cheese again returned to the press until the hoops are required for use again.

The object of pressing is to give shape, to press out any remaining whey, and to form a crust or rind. The acidity of the whey from the press is usually .95 per cent., but it may vary from .90 to 1.0 per cent. The amount of whey draining from the press depends on the moisture content and on the acidity of the curd. For Cheddars this should not generally exceed 4 lb. to 100 lb. curd. The fat percentage of the press whey should not exceed 3 per cent. The temperature of the press room should be about 70 degrees to 75 degrees Fahr. if possible.

CURING THE CHEESE.

It has been well said that the cheese is only half made when taken to the curing-room. On the management of the cheese during curing will depend to a large extent the quality of the finished article. The curing-room must be capacious, well ventilated, and free from dampness, otherwise moulds will cause trouble, and the cheese will be liable to sweat.

The temperature of the curing-room should be maintained between 55 degrees Fahr. and 60 degrees Fahr. At temperatures exceeding 60 degrees Fahr. the quality of the best cheese is impaired, and there is an undue loss by evaporation, with a resultant dryness of body. If the air is very dry and the cheese ''full acid,'' the rind sometimes cracks, thereby still further increasing the evaporation from the interior of the cheese. At low temperatures, although the curing process is slower, the quality of the cheese remains good, and there is considerably less shrinkage.

The humidity of the curing-room is another important factor, and should receive careful attention. If the air in the room is too dry, the evaporation will be greatly increased, and the body of the cheese will thus become too hard and firm. On the other hand, if too damp, the intervention of mould growth is practically certain. An effort should be made to maintain the humidity of the air of the curing-room at 80 per cent. of the saturation point, as measured by the wet and dry bulb thermometer.

Cheese should be turned daily in the curing-room for at least six weeks, and every second day thereafter until ready for sale. Most factories are fitted with turning dales, which render this an easy task. Cheese should not be sold until ripe. The marketing of half-ripened cheese is detrimental both to the producer's interests and to the consumer's digestion. It should be ripened for at least three months before consumption.

NEW ZEALAND DAIRYING.

We have received from the Secretary of the Waikato Winter Show Association, Hamilton, Mr. W. H. Paul, the prize list for the fourteenth annual show of the Association, with which are incorporated some highly interesting statistics showing the remarkable development of the industries of the Dominion and of dairying in particular. The record of that industry, the result of co-operation and the assistance of science, is well described as ''romantic development.'' We (in Queensland) have also made immense strides in all the phases of the dairying business, and the following short history of the progress made in New Zealand cannot but have an inspiring effect on all engaged in the further development of our dairy herds and on the methods of dealing with dairy products from the bail to the foreign markets:—

''If the real history of New Zealand's dairying industry were written, it would read like a wonderful romance. We have been accustomed to believe that our gold-mining held the only elements of literary interest, and indeed the old alluvial days were filled with the fascination of adventure, of strange happenings, striking incidents, of good luck and ill luck. Fortunes were made and fortunes were lost in those wild days, and even in the latter times of quartz-mining there was much to stir the imagination and to supply the stories that thrill the mind.

''But neither the rifling of the golden stores from Otago river-beds and West Coast beaches, nor the colossal treasures won from such reefs as the Caledonian or the Shotover have had such widespread influence on New Zealand material development, or have wrought such striking changes in New Zealand's landscapes as dairying. The old Israelites found a land flowing with milk and honey. New Zealanders, within a mere handful of years, have made the empty wilderness produce veritable rivers of milk, mountains of butter and cheese, and more honey, too, than ever the patriarchs found in that ancient land of promise.

"Goldmining devastated the country which yielded the greatest riches; its rewards were carried to other fields. Dairying has covered wide districts with beautiful farms and snug homesteads; its rewards have been spread among all who would work patiently and intelligently. Goldmining exhausted its sources of wealth the more energetically it was carried on; dairying increases its rewards the more intensively it is pursued and the longer it is followed.

"In 1888 New Zealand exported 2,995 cwt. of butter and 36,682 cwt. of cheese; in 1898 the exports were 96,601 cwt. of butter and 68,711 cwt. of cheese. It was practically in 1898, or only twenty years ago, that New Zealand's dairying industry commenced. By 1908 the exports of butter had leaped up to 229,971 cwt., and cheese had risen to 211,242 cwt. In 1918 they had lifted to 384,009 cwt. of butter and 914,100 cwt. of cheese.

"These are marvellous increases, but the advances in value were still more marked. In 1888 the total exports of dairy produce from New Zealand were valued at £200,000. In 1898 the value of butter exported was £403,690; of cheese £783,419. In 1918 the value of butter exports had reached £3,050,862, and cheese had reached £4,207,647.

"It is impossible to give an adequate comparison of the increase in values per cwt. during recent years, because war conditions have dominated market prices. In 1908 the price of prime quality New Zealand butter on the London market was 115s. 3d. per cwt., and it varied from 109s. 1d. per cwt. in 1909 to 125s. 8d. in 1912. At the beginning of the war in 1914 the average price was 116s. 3d. The average wholesale price of New Zealand butter in London during 1918 was 252s., and through the present year the average has been 248s. 5d. Cheese has been subject to just about the same fluctuations. In 1908, it was 62s. 1d., and it ranged from 58s. 9d. in 1911 to 66s. in 1914. In 1918 it averaged 130s. 8d.; during the present year it has been 155s. 4d.

"But these values do not represent the true rise; they merely show the commonplace quotations in a market, fixed and set by the law of demand and supply. The real romance of values commenced in the middle eighties, when the dairy farmers in New Zealand were selling their milk to the proprietors of private dairy factories at 2¼d. and 2½d. per gallon, irrespective of butter-fat contents. Milk from a well-bred Jersey, yielding 5 lb. and even up to 7 lb. of butter-fat per 100 lb., was paid for at the same rate as milk which gave only 1 lb. of butter-fat to the 100 lb. of milk. And dairying began to flourish, even under these conditions, because they were good compared with what had been.

"Previous to the introduction of the dairy factory and the export trade in New Zealand, the common price for farmers' butter was about 4d. per lb., and there was little demand for it; it was used more as a means of barter with the storekeeper than as a marketable product. The price of 2¼d. and 2½d. per gallon of milk, offered by the old dairy factories, meant more than 6d. and 7d. for butter, and there was none of the labour and risk of private manufacture. No wonder the dairy farmers twenty years ago welcomed the advent of the dairy factories; they meant more than a big increase in the value of milk; they meant an almost unlimited demand. Hitherto the output of the New Zealand dairy farm had been curtailed by the smallness of the local market; now the markets of the world were opened, and butter-fat has marched up to 1s. 6d., and even 2s. per lb.

"The romance of New Zealand's dairying industry has its origin in the brains of those scientists and mechanics who worked out the practical application of refrigeration to the preservation of foodstuffs. Such men are not usually credited with the possession of romantic capabilities, and could have no more idea of the effects of their discoveries on New Zealand than Tasman or Cook had when they first made these islands known to the world; but what marvellous results have accrued from their labours!

"Refrigeration has opened illimitable fields to industry. It has brought spring lamb from New Zealand to the winter dinners of Englishmen. It has spread the toast of Lancashire operatives with butter churned in the Waikato, and it has done more than this; it has played a dominant part in the manufacture of all dairying products. The modern factory manager in New Zealand no longer is at the mercy of varying temperatures; he can control them. His freezing plant has made him master of ferments and bacteria. Dairying in New Zealand has risen from a crude industry, where the farm churn was governed by a boy's whistle and the week's butter might be spoiled by a thunderstorm, to an organised science under which the weather has absolutely no power and quality is a matter of calculation.

"It is no exaggeration to say that no country in the world has witnessed so rapid and great development in the output of dairying products as New Zealand, and it is equally true to say that no other country has seen such a wonderful advance in the scientific and mechanical details of manufacture. The manager of a New Zealand butter or cheese factory must be a master of special chemistry; a single mistake of his might mean the loss of thousands of pounds, and on his skill depends the quality of material worth tens of thousands.

"New Zealand has probably the largest and best-equipped butter and cheese factories in the world, and her dairy farmers use more separators and milking machines than any others. Denmark is a great dairying country, and her people have long led the way in all the arts of butter and cheese making; but New Zealand, with all its drawbacks of distance from markets and its lateness in starting, has more than caught up with its greatest rival. In some things it has gone ahead, and New Zealanders say they have only just commenced dairying, and that the real development of this industry lies in the future.

"It is not only in mechanical and scientific development and the magnitude of its dairying output that New Zealanders have shown their energy and ability. It is in co-operative and financial organisation that they have achieved some of their greatest results. The old privately owned dairy factories have almost universally given way to the co-operative business, in which the milk-suppliers are the chief and, in most cases, the only shareholders. These associations are conducted, of course, entirely in the interests of the dairy farmers. Every economy effected, every improvement made in the handling of milk or cream and its manufacture into butter and cheese, benefits the farmers; and they go further than this, for some of these companies purchase fertilisers, implements, machinery, and other goods for their members, and even advance money for stock and such like things. They provide instructors who advise new farmers in the ways of handling dairy cows, growing fodder crops, and, of course, in the ways of increasing and improving milk-production.

"Of late years there has been a tendency for these individual factories to co-operate and even for co-operative associations to amalgamate. Striking instances of this development have taken place in the Auckland province, where the dairying industry has expanded remarkably.

"The New Zealand Dairy Association was formed in 1901 to handle the business on a co-operative basis which had previously been carried on by Messrs. Lovell and Spragg. As a co-operative concern under the management of Mr. Wesley Spragg and a board of directors its growth was phenomenal. Prior to its flotation as a co-operative company, its output of butter was 1,200 tons per year. Under the new arrangement it soon became a very large concern, having 3,500 milk-suppliers and manufacturing 6,000 tons of butter and 1,000 tons of cheese per year, whilst its annual sales amounted in value to nearly £1,500,000.

"Recently the New Zealand Co-operative Dairy Association amalgamated with the Waikato Co-operative Dairy Company, another company with a marvellous history. This Waikato Co-operative Dairy Company, under the management of Mr. W. Goodfellow, began in 1909-10 with an output of 150 tons of butter and a turnover of £15,000. In 1913-14 the output was 1,100 tons of butter and the turnover £125,000. In 1918-19 the output was 1,000 tons of butter and 2,250 tons of cheese and the turnover £600,000.

"The new amalgamation is known as the New Zealand Co-operative Dairy Company, Ltd., with its headquarters at Hamilton, Waikato, and is the largest co-operative company in the world. The new company will have 5,000 suppliers, and will receive the product of about 100,000 cows. It has eight butter factories, 10 cheese factories, 3 dried-milk factories, 16 cream factories, and a large number of creameries. The output of butter this season is estimated at 8,500 tons, of cheese 2,000 tons, dried milk 2,000 tons, and casein 300 tons, whilst the value of the turnover will be approximately £2,500,000. For a country with so small a population and so short a history the growth of such organisations is in itself a romance."

The Waikato Farmers' Co-operative Auctioneering Company, Limited, furnishes us with another example of the great value of co-operation amongst farmers, which we hope to see more largely and beneficially extended in our own State as time goes on.

The Waikato Farmers' Union began its career in a very modest manner. We are told that: "In the year 1906 a few Farmers' Union enthusiasts got together, and the first meeting to discuss any concrete proposal was convened on 7th July of that year by Messrs. Joseph Barugh and H. S. Hawkins, the present chairman and vice-chairman of directors respectively. It was taken up by the Hamilton branch of the Farmers' Union, and subsequently a most enthusiastic meeting was held on 15th August, 1906. This meeting led to the appointment of an executive to go fully into the matter and endeavour to bring into being a co-operative company run in the sole interests of the farmers. The result of this committee's labours was eminently satisfactory, as the old-established firm of Messrs. McNicol and Co.—who, by the way, had been operating as stock and commission agents throughout the Waikato—was acquired on more than reasonable terms, and the present company was incorporated under the Companies' Act on 5th April, 1907. From that date the Farmers' Co-operative Auctioneering Company, Limited, has never looked back. It was commenced with 735 shareholders, and to-day the number is 4,500. At the end of the company's first financial year the paid-up capital amounted to £44,730, and the uncalled capital £5,355. To-day the paid-up capital stands at well over £400,000 and the uncalled at approximately £75,000. In 1908 the permanent staff numbered 13; now over 200 permanent employees have been found necessary to carry on the firm's business. As year has followed year the auction sales have increased beyond expectations. Whereas in 1908 they numbered 150 per year, at present the figures have reached the 800 mark. This year a record has been established as far as the turnover is concerned. At the end of the financial year 1919 the figures were £2,149,432. To-day the turnover has reached the large sum of £2,500,000—an increase of 350,568. At 31st January, 1910 (three years after the start of the company), the total liabilities were £57,482, while the assets stood at £123,736. It will thus be seen that the percentage of liabilities to assets (excluding uncalled capital) was 46.45 per cent. The figures at the end of the last financial year were: Total liabilities £230,806, assets £588,637; percentage of liabilities over assets (excluding uncalled capital) 39.21 per cent. At 31st January, 1919, the reserves of the company totalled £51,534 18s. 11d., the nominal capital being £750,000. During the time the company has been in existence no less a sum than over £231,000 has been paid to shareholders by way of rebates and dividends, and practically the whole of this money has been distributed to the farming community in the districts in which the company is operating.''

GROWTH OF TREES.

In our article on ''Forestry,'' which appeared in the issue of this journal for January, 1920, we gave instances of the diametric growth of some varieties of timber trees.

Later, Mr. Swain, Acting Director of Forests, in an interview with a ''Courier'' representative on the subject of the rate of growth of trees, admitted the importance of the subject, as on the growth of timber largely depended the financial position of forestry departments. In Europe, where the winter and summer seasons were strongly defined, Mr. Swain said, annual rings were made on trees, and thus it was easy to determine their ages, but there were no such clear markings in Australia, and the forester here had adopted the plot system of calculation. Sample plots of trees were measured to ascertain the rate of growth in the forests. Rather than measure the seedling tree, however, till it had attained maturity, the forester took the diameter of trees every few years, and determined the rate of growth of species in the forest, roughly, in that way. In the Pilliga Forest, in New South Wales, by this method it had been ascertained that it took 125 years for a cypress pine to mature, while in the Warialda district similar trees came to maturity in seventy-five years. Mr. Swain pointed out that many factors entered into the determination of the rate of growth. These records in the mother State were made in drought periods, and it had been found that in good years the rate of growth was more rapid than the drought record indicated. Then the matter of congestion in the forest had a lot to do with the progress of the tree, and when forests were thinned out growth naturally became much more rapid. Red and white cedars in Queensland were very rapid growers. In the seedling stage these trees might grow to 7 or 8 ft. in the first year, while hoop pine might grow only a few feet or inches. Cedars, however, were liable to be cut back by droughts and frosts, whilst pine was hardier, and in course of time might make better all-round growth than the cedars. Silky oak was another fast-growing Queensland tree. One of the best results obtained on Fraser Island was in the case of the red stringy bark tree, a seedling of which reached a height of 45 ft. in three years. Blackbutts attained to 40 ft. in a similar period, while cypress pine, a smaller tree, averaged from 8 ft. to 11 ft. Mr. Swain mentioned the very interesting fact that Australian trees taken to other countries had made a more rapid growth in those countries than such trees had averaged in Australia, whilst trees brought from America to Australia grew more rapidly than they had been accustomed to do in their native haunts.

The Horse.

A NEW DRAUGHT ANIMAL.

[A Zululand farmer has been crossing a jack donkey with a zebra mare, which, as a result, has recently given birth to a foal. The following article shows what the U.S.A. Government has been doing in a similar direction.—ED.]

For thousands of years the horse, the ox, and the mule have been used in agriculture and other operations requiring haulage power. Of late years the tractor has become their rival. Now, through the agency of the U.S.A. Government, a new and powerful animal is being brought into use—an animal more hardy than the horse and more beautiful; and, it is said, possessing a greater intelligence and much greater docility.

For generations the so-called Rocky Mountain canary, or burro mule, has been famed in the States as the slowest, the dullest, sleepiest, and at times the most stubborn of brutes. Those who have traversed the Rockies know the "canary." They carry many a memory of mountain passes perilous to life, where the burros, hardly moving at their wildest moments of hurry, have deliberately stopped, and refused to move except backwards to the extreme edge of the canyon. They can only recall the "canary" as the worst of animals that ever carries a load on its back, and none has a respect for it. Now the U.S.A. Agricultural Bureau has placed it in the position of being the parent of a new and wonderful animal of great use.

A ZEBRA SIRE.

Ever since the zebra became known attempts to domesticate it have proved useless. The temper of it makes it practically untameable. It has been crossed at times, but such crossings have resulted in animals of no value at all, though of great beauty. The intractability of the zebra has ever remained. Some years ago the U.S.A. Government decided to put the matter on a scientific basis. It was resolved to cross the zebra with an animal so lethargic, so docile, that the fiery, savage nature of the zebra would be reduced to the minimum, and in the burro of the Rocky Mountains that animal was found. A Grevy zebra, the largest of the species, the most vicious and untameable, was taken as the sire, and a "canary" became the dam, and the new breed was at last raised scientifically at the Government experimental farms at Peltsville, near Washington. That was some ten years ago. To-day the new animal is not only to be seen in circuses and zoological gardens in the United States of America, but is also being used on the land with immense success.

THE "HYNEY" DESCRIBED.

It is believed that it—up to the present no name has been coined for the new species other than that of the hyney—will quickly become a rival of the horse for work, for driving, and for riding. The animal has much harder muscles than the horse, and has all the mule's capacity and endurance for work, and is easily fed. Docile, easily trained, pretty of body, and trim in outline, the hyney is more beautiful than the horse, and more tractable, too. The colts are easily broken to halter and to harness. The colour has changed from the grey-white of the zebra to the darker hue of the mule, though the stripes of the zebra remain, and the remarkable fiery eye of the latter is there, still one of high intelligence, but with more amiability. Practically every physical attribute of the zebra—one of the most perfect and beautiful animals known—remains; yet its terrible temper and nervousness have been counteracted by the mule's proverbial stolidity and sluggishness. The hyney has all the fleetness of the zebra and an extraordinary strength of physique in health and digestibility; while its power of haulage exceeds that of the average horse. So it may be that in years to come, when the hyney has become popularised, one will see a hyney team ploughing instead of Dobbin and his mates.—"South African Farmers' Advocate."

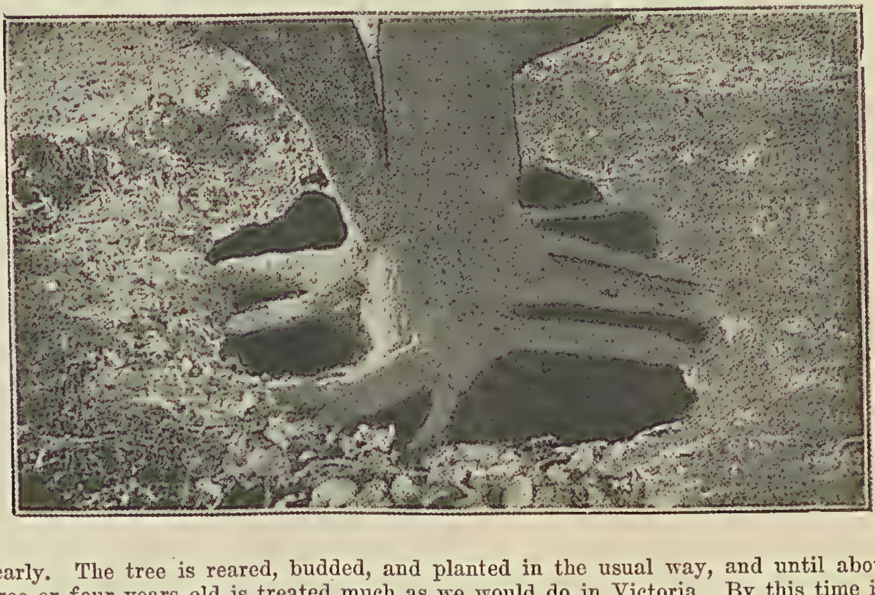
The Orchard.

SPANISH SYSTEM OF GROWING ORANGE TREES.

In the second edition of Mr. A. H. Benson's work on "Citrus Culture," he mentions "collar rot" and the remedy for this disease. He also states that, if an orange tree is planted on badly-drained clayey soil, no treatment will prevent or cure collar rot.

The Government Viticulturist of Victoria (Mr. F. de Castella) (1909), writing in the February number of the "Journal of Agriculture" of that State on "The Orange in Eastern Spain," describes a remarkable method adopted in that country for the prevention of collar rot. He says:—

"The most remarkable peculiarity in connection with the cultivation of citrus fruits in the Levante is the system of growing the trees over a hole, with the collar and starting point of the main roots exposed to the air. This system is very generally followed. It was at the Granja Valenciana (experimental station and school at Valencia) that I first remarked this curious method, but all the orange trees which I saw subsequently were treated in the same way. The photograph shows this very clearly. The tree is reared, budded, and planted in the usual way, and until about three or four years old is treated much as we would do in Victoria. By this time its surface roots have become sufficiently strong to support it; a hole is dug underneath it, and the tap root is entirely cut off with a saw.



"The hole, which is a foot or so in diameter, and of about the same depth, is not filled up. It remains always open, any dirt or rubbish which may fall into it being regularly removed. When irrigating, which is usually done by flooding, a small dam is made around the tree at a distance of a couple of feet from it, to prevent water getting into the hole. The appearance of these trees is very striking; their bases may be compared to large spiders sitting over holes in the ground. The object of the treatment is to prevent collar rot and gumming (Mal de Goma), which used to be prevalent, but now seems to give little trouble. The sour orange stock is the one usually employed, even for lemons; lemons worked on lemon stock are said to be liable to Mal de Goma. The trees struck me as being very healthy. They were loaded with an abundant crop of fine fruit; in fact, everything seemed satisfactory excepting the price."

ERADICATING FRUIT PESTS.

An important discovery of a method of destroying fruit pests was received from Sydney on the 29th March last by the "Brisbane Courier" to the following effect:—

"The expensive and tedious process of eradicating fruit pests by means of the spray pump and fumigating plant, involving ceaseless toil and eternal vigilance, may, as a result of experiments now being carried out in New South Wales, soon be eliminated from the orchard equipment. A totally new method of coping with fruit pests has been devised, and, although it has by no means travelled beyond the experimental stage, from evidence already available it holds out a strong probability that a simpler, more effective, and less expensive treatment is in sight. In contrast with the drawbacks associated with spraying and fumigating, the new treatment aims at combining with natural forces to carry out the remedial work, and uses the sap circulation to convey the insecticide. By boring a hole, say, half an inch in diameter, and 3 in. to 4 in. deep, in the trunk of the infested tree and inserting a suitable quantity of a specific, which is not itself a human poison, in forty-eight hours there are evidences that the sap, even to the terminal tips of the branches, has been affected. In a few weeks the parasites are killed without apparently checking the health or bearing capacity of the tree. There is every reason for thinking that the discovery holds far-reaching possibilities."

STRAWBERRY INSECTS AND DISEASES.

THE CROWN BEETLE.

A strawberry-grower in Western Australia writes, in an article to a W.A. journal, that strawberry-growers in that State are worried this season, more than ever, with that persistent pest, the Crown Borer or White Grub. Twenty years ago it threatened the plantations in Tasmania, where strawberries are largely grown for the jam factories. In Western Australia the fruit is grown for the table, and the method of doing this helps considerably to get rid of this pest, as they are grown in drills. After the runners have been removed, and the beds cleaned up, remove as much foliage as possible, stripping right to the crown. This should be done just previous to blossoming. Lay baits of parsnip cut in half, and sprinkle thereon Paris green and flour in equal quantities. Place these baits under pieces of old bagging or boards to prevent drying. The writer further stated that he found this to be the most effective remedy.

Mr. W. French described and illustrated the weevil in an article on strawberry-growing in his "Handbook of the Destructive Insects of Victoria" in 1893, and also in this journal in August, 1908, and said that, to the best of his belief, Australia was free from it. It appears, however, that the pest is in strong evidence to-day, both in Victoria and in Western Australia. The remedy he suggested is to burn over the field after the fruit is picked, when, if the insects are not destroyed, the plants should be dug up and burnt. For the strawberry-leaf blight, rust, or sunburn, indicated by small purple or red spots appearing on the leaves, and eventually becoming larger, making the leaf appear blotched, Mr. French advised spraying with Bordeaux mixture at intervals of two weeks as soon as the fruit is picked. The leaves are easily destroyed without injury to the plants by quickly burning off a thin layer of straw which is spread over the patch after the fruit is off. When farmyard manure cannot be obtained, a good dressing consists of 3 cwt. of bone-dust, 3 cwt. superphosphate, 1 cwt. dried blood, 1½ cwt. sulphate of ammonia, 2 cwt. sulphate of potash per acre, or in these proportions for smaller areas.

PLANTING THE STRAWBERRY.

It is impossible to fix a hard-and-fast time to transplant, as the seasons differ so much in different localities, but, if the ground is in good order, and the weather showery, a start may be made as early as 1st March, or later in some districts. For garden culture, the runners may be planted in rows, 18 in. apart, and at a distance of 12 in. between the plants, and when one crop is done, the plants may be dug in, the ground well manured and got ready for planting the following March. For field planting, the distance between the rows should be 3 ft., and the plants 1 ft. apart. The roots must be placed in the most natural position possible, and the soil well pressed down upon them, the collar of the plants being just level with the surface of the ground. This is of vital importance. Planting the plants and just sticking the roots under the soil are two very different matters.

MULCHING.

Forest oak makes a capital mulch. Failing that, half-decomposed leaves will keep the fruit clean from grit, and also makes a good humus.

Tropical Industries.

THE SUGAR DISTRICTS OF SOUTHERN QUEENSLAND.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant (Mr. J. C. Murray):—

Throughout the month the districts of Nambour, Bundaberg (which includes Woongarra, Barolin, Millbank, Gooburrum, and Sharon), and the inlying areas between the Maroochy River and Tiaro have been visited.

NAMBOUR.—This district, including the Maroochy River, looks very well, considering the weather conditions of the last twelve months.

The cane presents a green and growing appearance and the farms for the most part present a clean aspect. The autumn and spring plant cane is not quite as forward as this time in past years, the 1919 drought not only interfering with efficient planting, but it also seriously affected the subsequent cultivation, and, in case of ratoon crops, ratooning.

There is no reason to anticipate, in these districts, anything in the nature of a failure in the sugar crop, and, although the harvest will not be a large one, fair returns are to be expected.

With regard to varieties, the Q.813, 285, Gingila, and D.1135 are growing well. N.G. 16 is doing well in places, though it is doubtful if the cane is worth planting in the Nambour district. Q.813 is a variety that is coming into favour, being a cane that apparently does well on a great variety of soils, ratoons and stands over fairly well, and is, in addition, on account of the growth of the top, a cane that protects itself from the sun's rays to a large extent.

A notable feature with regard to cane-growing here is a new piece of land that has been reclaimed from the scrub recently by Mr. Bowder, of Yandina, and planted with cane, about 50 acres in all. This land for a long time has lain idle, and was regarded by many as more or less unsuitable, but by the way the cane is striking, and the general appearance of the plantation, much credit lies with the owner. The soil on this place, which lies in between Yandina and Nambour, is a light forest loam, cultivating and draining well. D.1135 is the principal cane growing.

WOONGARRA-BAROLIN.—The cane on the areas is having a hard struggle to grow. Not nearly enough rain has fallen, and most of the plant cane for the time being is making very poor headway. This is bad luck for the farmers in these parts because the greater part of the November planting struck very well, and would have been making a fine showing by this time had good weather prevailed. The last autumn plant cane is, however, very backward, and on some farms the growers will be lucky if they get anything out of it at all. It is unlikely there will be much to cut here this year, and unless plentiful rains prevail in the next six months the prospects will not be too bright for 1921.

As against this, however, must be taken into consideration the richness and fertility of these soils and the remarkable manner in which the farmers have combated noxious weed development. These factors all contribute towards rapid growth if rain falls, and it is difficult to find land in the State more suitable for sugar cane growing, provided the farmers are only blessed with an average amount of rain. As mentioned in previous reports on these areas, the D.1135 appears all round to be the most suitable variety. It is probable, though, that if Q.813 were taken and tried thoroughly it would give satisfactory results. Q.285 is a cane that ought to grow on the heavier soils of the river banks.

Qunaba Plantation has a fair amount of Badila planted, also a fair quantity of cowpea for green manuring purposes, but the disheartening results of the loss of the rainy season make it difficult to comment on the growth of the New Guinea cane.

MILLBANK.—There is very little to add since my last report on Millbank. The farmers are busy cultivating their cane, and keeping down noxious weeds, particularly nut grass. The spring planting has struck very well, but not much growth is in evidence just at present. The ratoon cane is green and healthy looking, and generally speaking this riverside area has held out better than the uplands.

Lime is essential, as evidenced by repeated tests taken; also analyses show marked shortages of potash. Farmers require to be alive to the value of having their soil tested, as often much trouble and expense is saved.

Green manuring would greatly add to the fertility of these lands, as well as increase their drought-resisting qualities. Increased alkalinity would also result, which, as mentioned before, is badly needed.

GOOBURRUM.—The cane probably looks more vigorous in this area than any other around Bundaberg.

Seepage is not heavy on these farms; consequently more subsurface moisture prevails than commonly occurs on surrounding areas. Ploughing preparatory to planting is proceeding, though the farmers may hold off for a time to see how the weather is. If they plant now, though, there is no reason to anticipate not getting a strike, as the soil underneath is fairly moist. Noxious grasses are well in hand, and, as far as can be observed, very little trouble is being experienced with cane pests.

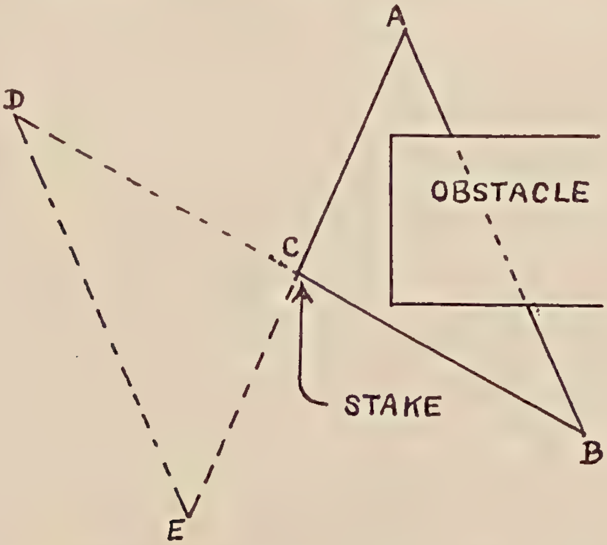
SHARON.—The farms in this district are, of course, suffering from want of water, but, generally speaking, the growers appear to be optimistic. The spring planting has struck well, with a very small percentage of misses, and the autumn planting and first ratoon cane looks green and hardy. Planting was in progress on some of the holdings, principally Demerara 1135, the soil working up to a good surface condition. Some parts of the land, however, show marked shortages of potash, phosphoric acid, and nitrogen. Fungoid parasites and grubs are not frequently met with, although noxious weed growth is considerable. More intensive cultivation would materially assist growth and minimise the effect of the dry weather.

With regard to cane growing between Tiaro and Yandina, there is very little done at present. At such places as Cooran, Eumundi, and Cooroy, a few farmers have cane in, but are not seriously studying the industry, finding other pursuits more profitable.

There is plenty of good cane land in these areas, but farmers consider at present that incidental expense, including transport and milling, is too much against them.

MEASURING INACCESSIBLE DISTANCES.

One of the simplest methods of measuring the distance between two points when an obstacle prevents a tape-line being stretched between is as follows:—To measure from A to B, put in a stake at C, so that the lines CA and CB clear the obstacle. Measure from C to A, then swing round the tape-line and get a point E in line with C and A, and with the distance CE equal to CA. In a similar way, get the point D in line with C and B, and with the distance CD equal to CB. The length from D to E will be equal to the length from A to B.



Horticulture.

IMPRESSIONS OF SOUTHERN PARKS AND GARDENS.

Address by Mr. E. W. BICK, Director, Botanic Gardens, at the Horticultural Society's Show, 20th April, 1920.

Having gone through to Adelaide and stayed on my return journey at the various places to be mentioned later, I propose to deal with Adelaide first. For the benefit of those who have not had the privilege of visiting this beautiful city, I desire to furnish a few facts as to the foundation and lay-out of the wonderful capital of South Australia. The site was selected and the city designed by Colonel Wm. Light, first Surveyor-General of the State. The city proper is one mile square; on the four sides are four terraces—North, South, East, and West. Outside these are park lands half a mile in width; adjoining are the suburban areas. Inside the city are six squares, with an average area of about 4½ acres, nice little green patches of turf and trees intersected by paths, and in prominent positions statues of notable personages. One of the squares is called the "Light," in honour of the designer of the city. What a difference might have been in our City of Brisbane had the same kind of "Light" been available at its foundation! None of the park lands can be built upon except for public purposes. From the Railway Station, at the western end of North Terrace, fringing the park lands, are Parliament House, Government House, university, school of mines, art gallery, public library, museum, and hospital; and botanic gardens at Eastern end. The park lands under the control of the Municipal Council total 1,900 acres, and include numerous small parks and gardens, three large public gardens, and eleven principal parks. Of the latter, the Adelaide Cricket Oval and the Victoria Park Racecourse are revenue-producing. The street gardens along North Terrace are well kept, and good displays of flowering plants are made in season. The deciduous trees of the streets—planes, elms, oaks, &c., were in glorious new leaf, affording fine shade. The English elm, owing to its pronounced suckering habit, is becoming somewhat out of favour, but the kurrajong is very largely used as a street and park tree. I was rather surprised to see *Lagunaria patersoni*, a Queensland tree, closely related to the hibiscus, has also been freely planted. Avenues of plane trees at their best look remarkably well, and *Grevillea robusta* lining a street showed Queensland represented again. At the Botanic Gardens Mr. Bailey gave me every facility to see his beautiful gardens, and also enabled me to enrich our collection of plants. I envied him his water supply and some of the gifts that show such a fine public spirit and interest. Why is it that Brisbane is so badly off for bequests? Is it that our moneyed people go South or elsewhere to spend what they draw from Queensland? In Adelaide thousands of pounds have been given for public purposes. In the Gardens the kiosk was a gift, as well as a new bushhouse, a large fountain, statuary, &c., whilst about the city are numerous instances of benefactions. In Ballarat it is the same, some very notable marble statuary, with building to house it, may be seen in the Gardens, while other evidences are prominent in the streets. At Geelong the same good public spirit is brought to one's mind, whilst in Melbourne and Sydney evidences of the same spirit of generosity by donors are frequently to be met with. The Adelaide Gardens, owing to the cold winters experienced, are well equipped with glass houses, there being about a dozen, besides the palm house with dome rising to between 30 and 40 feet high, and the Victoria regia house, built specially to grow this unique waterlily. In the show houses, fine displays of flowering plants are made in season, with gloxinias, streptocarpus, pelargoniums, both regal and zonals, cinerarias, primulas, &c., ornamental plants such as rex begonias (a very fine collection). Caladiums, crotons, and anthuriums made a fine show, as also did a good collection of bromeliace, comprising æchmea's, bilbergia's, nidularium's, and tillandsia's. Ferns, too, are well represented. Quite a lot of bedding out is done, and fine displays made with chrysanthemums, cinerarias, carnations, and all kinds of annuals. There is also a very good rose garden, well laid out, and a fine collection; climbers are chiefly grown on separate pyramids. I was in time to see quite a good lot of bloom, particularly the wichurianas and polyanthas. Mr. Bailey informed me that they get better roses than we do in Brisbane, but our flowering season was much longer. The better roses are owing to the cold of winter ripening the wood before pruning; the shorter flowering season is owing chiefly to the hot winds that sweep over the Adelaide plains. The Gardens are well off for ponds or lakes, one specially formed for nymphaes has the finest collection in Australia. I have forgotten the exact number—about 130—in all colours. A large lake, home of numerous waterfowl, with island near kiosk, is margined with Calla æthiopica (lily of the Nile). At the time of my visit they were in full flower with fine effect. Large collections of neriums, magnolias, syringas (lilac) are grown, also many fine flowering shrubs. Trees are also well represented, a fine specimen of *Stenocarpus sinuatus* (wheel of fire) is very prominent. Another fine feature is the class grounds, in which plants are grown in natural orders, from ranunculaceæ to graminæ. This is specially for students, and it is a very important and interesting phase of botanic gardens work. The Botanic Park, next to the Gardens, has been thickly planted with trees, the roadway running parallel with garden fence having a splendid avenue of planes. They have grown together at top and sides, and, looking along the centre of the roadway, it forms a beautiful, long tunnel of green, and is a favourite motor drive. The park extends to the Torrens River. Another important branch of the Gardens is the type orchard at Mylor. This is situated on the Mount Lofty Range, within easy distance of the city. Mr. Bailey is keen on this work, and they have about 1,400 kinds of apples, about half that number of pears, and full collections of apricots, plums, persimmons, almonds, Barcelona nuts, English gooseberries, currants, and raspberries. In the fruit season displays of fruit are made in the Botanic Museum at the Gardens—150 kinds of apples, for instance. This creates great interest, and is of practical use, as it shows fruitgrowers the kinds to plant and those to avoid. There is a large amount of land available in the hill country suitable for the fruits I have mentioned, and at the time of my visit the cherry season was in full swing, large quantities being grown. The well-known ornithologist, Captain S. A. White, with his motor car, gave Mr. Bailey and me some glorious trips to see some of the hill gardens; there may be seen gorgeous rhododendrons—they were just at their best—large masses of flowers of all shades of colour—and also azaleas, including the mollis type of deciduous kinds, that require a colder climate than ours to thrive in, many having tones of yellow and orange colours so distinct from the *A. indica* type we are familiar with. Fine collections of Japanese maples, with beautiful tinted foliage, were at their best, and large collections of conifers in fine healthy growth with numerous golden kinds were seen; in fact, nearly all the conifers, from the gigantic wellingtonias and pines to the small junipers, may be seen growing luxuriantly. Beautiful tinted copper beech trees and silver and other birches add their quota to the fascinating scene. Foxgloves, too, do remarkably well—fine strong stems of flowers over 4 ft. high, in delightful colours, self-sown in many instances, grow in profusion.

I enjoyed every moment of my visit to the hill gardens, the old beautiful home and grounds of the late Sir Edward Stirling, with its wonderful collection of rhododendrons and other plants I have mentioned, and Mr. F. H. Snow's garden (a newer place), with a fine collection of plants, had, in addition to those spoken of, a very good lot of delphiniums in flower. We were very fortunate in seeing these gardens under such conditions, and I am very grateful to Miss Stirling, who kindly acted as guide through their grounds, and to Mr. Snow's gardener, who acted in a similar capacity in his.

I am afraid if we do not soon leave Adelaide I shall keep you here all night, if I speak of the other gardens.

Leaving my good friends in Adelaide at 4 p.m. per mail train, I arrived at Ballarat next a.m. for breakfast. The street gardens here are well kept, and, at the time of my visit, gay with flowers. The trees, also, in the streets, are a fine feature. A tram ride through the city and for some distance round the shores of Lake Wendouree, brings one to the very fine Botanic Gardens. Mr. Toop, the curator, specialises in floral displays under glass of tuberous-rooted begonias (finest in Australia) which would be worth going to see when in flower. Unfortunately I was too early, but the show of calceolarias were of the finest type procurable, some of the flowers of which were 4 in. across. It was an eye-opener to me—just a glass-house full of them. It was a wonderful sight. The schizanthus, also a fine type grown in pots, bushy plants about 2 ft. through, bore very large flowers of lovely hues. Another house of pelargoniums, with flowers even surpassing the boomed illustrations we see occasionally in catalogues, made a fine display. A very good collection of orchids occupied another house. In a sheltered corner masses of rhododendrons were a feast of gorgeous colourings. Mention has already been made of the beautiful statuary. In addition to these there are a number of classical pieces about in the Gardens, also gifts. Roses do well here and were flowering freely. There are also fine examples of conifers. A red flowering, or, as it is called, the "Waratah," everlasting pea, a robust grower, with large clusters of bright red flowers, has a very fine effect when in full bloom, as I saw it. A climbing polygonon also attracted my attention with its vigorous growth and floriferous habit, that makes it well worth a place in any garden; perhaps it is not quite as good as our white antigonon, to which it is related. The Ballarat Gardens are under the municipal council, as also are the large park lands adjoining, about 150 acres combined. These are well planted with trees, and, with the lake, covering 600 acres, on one side, where motor boats carry passengers across to the other side, make ideal picnic grounds.

After leaving Ballarat my next stay was at Geelong. Johnston Park, in the centre of the town, near the Town Hall and Art Gallery, is in process of rearrangement and being added to, but sufficient has been done to show that it will shortly be one of the features of the city. The Botanic Gardens are some distance out of town, the entrance being through park lands that had suffered with droughty conditions. *Pinus insignus* had been largely planted in streets and parks, but are now being cut out, owing to being unsuitable; they were fairly large trees, and the timber commands a ready sale at good prices, being chiefly utilised for case timber for the dried fruit industry of Victoria. A fairly good collection of plants may be seen in the Gardens, but they are evidently not supported by the council to the same extent as at Ballarat. I was interested in seeing a fine specimen of *Harpephyllum caffrum* (Natal plum) doing very well, and Mr. Day, the curator, informed me that it fruited freely, and the seeds were in good demand. A fine plant of the Queensland flame tree (*Sterculia acerifolia*), doing very well, also attracted my attention. A large bushhouse with some fine specimens of *Rhopalostylis sapida* from New Zealand and *Rhopalostylis baueri* from Norfolk Island stood out well amongst many other palms. There was also a nice lot of ferns.

From Geelong to Melbourne is not a very long journey—45 miles. On arrival there I lost no time is getting into touch with Mr. Cronin, the curator of the Melbourne Botanic Gardens, who spared no effort to make my visit both pleasant and profitable, and very kindly helped with a fine lot of plants for our Gardens. The design of the Melbourne Gardens is a very fine example of landscape gardening. There are ten principal divisions, each under a distinctive name—Western, Hopetoun, Prince's, Oak Lawns, and so on. The groupings of trees and shrubs leave little to be desired; it shows off the very fine collection of plants most advantageously. Such a collection! I could have spent many days of profitable time there. The fern gully is one of the features of the Gardens—but then there so many fine features. It has been planted to show how tree ferns grow naturally; large trees here and there provide sufficient shade for the ferns; running water is seen in plenty, natural-looking watercourses carrying it about all through the area. The tree ferns are growing quite close together, forming quite a dense thicket. The curving paths that wind through this delightful spot provide a place for a well-shaded stroll on a hot day. The whole atmosphere of Fern Gully reminded me of that of one of our North Coast scrubs. There are about 10 acres of water—lakes have been formed from original swamps, designed, too, with taste, that gives a beautiful effect; while here and there are islands that provide a sanctuary for the numerous waterfowl that inhabit this favoured region. Numerous water plants fringe the banks; at the ornamental lily lake may been seen a fine lot of nymphæs. Many of the newer kinds that have been raised by cross fertilisation have beautiful large flowers. In a number the shades of pink are very fine. The large collection of Australian plants appealed to me very much. There appeared to be miles of a long border running along the western and southern boundaries of the Gardens. Here may be seen, probably, the finest collection of purely Australian vegetation to be found anywhere. Needless to say, our State is well represented. Plants in systematic arrangement of natural orders are grown in pots in a pavilion or lattice shade house—there is a very good collection, about 160 natural orders being represented, and it must be of great benefit to students. The growing of them in pots naturally entails a good deal of work. The Adelaide system of growing in open ground has many advantages, but the Melbourne system enables the collection to be kept in a much smaller area, and additions may be made at any time; but I must not make comparisons. The glasshouses, though not very extensive, are well stocked with a good collection of orchids, ferns, palms, and foliage plants, and fine displays of gloxinias, begonias, and other flowering plants are made in their seasons. Mr. Cronin has been doing some good work in the cross fertilisation of watsonias, iris kæmpferi, and dahlias; he showed me some fine seedling watsonias—large flowers, in many shades of colour. His seedling iris also were very good, in many instances showing a great improvement on those imported from Japan. Mr. Cronin is an esthusiastic dahlia grower; I am sure you would all enjoy listening to him dilating on this, one of his pet subjects. I should like to see him here and hear him give us a paper on this or some other subject that he is keenly interested in. To summarise my impressions of the Melbourne Gardens, the outstanding features are the extensive well-turfed lawn areas, beautiful landscape views, fine groupings of trees and shrubs, the fern gully, Australian vegetation, beautiful lakes, and fine rock gardens and mounds. With Mr. Cronin as guide, I paid a visit to Brunning's nursery, and was struck with the immense number of dahlias that are propagated from cuttings each season. We also made a call at Rippon-lea house. This beautiful house and grounds, once the home of Sir Frederick Sargood, is now the property of Mr. Nathan, who is an enthusiastic horticulturist. He has built large conservatories and plant houses, and, stocked full of the finest plants procurable, makes it one of the show places of Australia. In no public gardens can better plants be seen

—house after house full of orchids. Such a feast of beauty! Another house all caladiums, and fine plants too. It was interesting to note that many of the best originated in Queensland, raised chiefly by Mr. Summerlin, of this city. Mr. Orchard, the head gardener in charge, who, by the way, is a very keen gardener and noted orchid-grower, said that better caladiums than some of the Queensland-raised ones could not be obtained anywhere. Before leaving Melbourne I felt that no horticultural visitor to the city can fail to be delighted with the fine parks and gardens in and around Melbourne—avenues of trees, and, in many cases, street gardens. All classes are developed—green lawns, rock gardens, flower beds, and mounds all lend themselves to the beautification of their surroundings. It would take too long to-night to go into detail, but I must mention Alexandra Avenue and St. Kilda Road, of the thoroughfares, and Alexandra Park and Fitzroy Gardens.

After saying good-bye to my Melbourne friends, Sydney claimed my attention. At the Sydney Gardens I was very kindly received by Mr. J. H. Maiden, I.S.O., Government Botanist and Director of the Botanic Gardens, who has done so much good work on the flora of Australia. He has a very lively interest in Queensland, and expressed a desire of assisting me in every possible way. When handing me over to Mr. Ward, the Superintendent of the Botanic Gardens, Mr. Maiden made known these wishes. Mr. Ward carried out his part admirably, and I spent a most enjoyable and profitable time. The Sydney Botanic Gardens have a very high place in the gardens of the world. Where could a better position be found than on the shores of the incomparable harbour? The sloping banks of turf and beautiful lawns, the large collection of plants displayed in such fine arrangement and in high state of cultivation, give a visiting horticulturist a study that is both profitable and interesting. I noticed several fine improvements since my last visit—the rearrangement of the trial grounds; the building of a system of humus pits, whereby all vegetable matter of garden refuse is rotted down and returned to the borders; the raising of one of the lower lawns by stripping the turf, filling up with a good depth of soil, and replacing turf, making a fine lawn of what used to be a very low-lying piece of ground. One of the new rockeries in the lower garden has a fine collection of Phyllocacti, many of them being Sydney Botanic Gardens hybrids, showing great promise. Mr. Ward is an enthusiast in this and many other phases of garden work, and I was very fortunate in being able to obtain from him for our Gardens a good collection of Phyllocacti that should do well here. A very valuable donation to the Sydney Botanic Gardens was made last year—the ''Burton Bradley'' collection of bulbs and plants, numbering about 10,000, comprising the best hippeastrums, over 4,000 bulbs representing over thirty-six years' work in cross-fertilisation, Amaryllis Belladonna, over 3,000 crinums, all known species and many hybrids that would be hard to beat anywhere, gladioli, clivias, miniata hybrids equal to the best imported kinds, a fine lot of Gloriosa hybrids, and collections of most other flowering bulbs. The late H. H. B. Bradley was a very keen horticulturist and a life's work is represented in the collection. Fortunately, through his family donating the whole to the Botanic Gardens, the work can be carried right on. Mr. Ward brought under my notice a strain of gladioli named ''Fordhook,'' hybrids that flower from seed in four months. A packet of seed for trial were sown at the end of December; 75 per cent. of the plants flowered by the following May; dying down, they were lifted in June, planted again in July, and flowered again in November and December, giving two flowerings within twelve months from seed. Gladioli plants from other seed sown at the same time were only 4 inches in height when Fordhooks were 2 feet high with 15-inch spikes of flower.

The Palm collection in the Gardens is a very large one, and grown as they are in a well-sheltered position, with a soil that suits them, many fine and rare specimens may be seen. I was again very fortunate in being able to obtain quite a number for our Gardens. Another interesting collection, that of water plants grown in large glass jars in a bushhouse, must be of great benefit to students. The large collection of Opuntias (prickly pear), probably the finest anywhere, all named, is an evidence of Mr. Maiden's interest, and good work accomplished, in classifying, and assistance in other ways, to deal with this awful pest. The Eucalyptus collection, also a very large one, somewhere in the vicinity of 200 species, is a reminder of those magnificent tasks that Mr. Maiden is still hard at work upon. "The Critical Revision of the Genus Eucalyptus" and "The Forest Flora of New South Wales" when completed will be lasting monuments of his life's work.

The glasshouses are a strong feature of the Gardens, some fine show houses open to the public at certain hours are well stocked with a beautiful collection of plants, notably palms, crotons, nepenthes, ferns, dracenas, and anthuriums. The palm collection is very large and well grown. Other houses hold a fine collection of orchids that appears to have been largely added to since my last visit. Altogether there is a splendid range of glasshouses and frames of a well equipped, substantial nature, and every opportunity is taken to make fine displays for the benefit of visitors.

A Japanese garden, with quaint stone paved paths and typical rustic bridge over adjoining pond, attracts attention. It is well furnished with Japanese plants consisting of numerous small-growing beautiful bamboos, iris, maples, and some fine varieties of Hydrangeas that were in full flower. Many of these are not yet grown in Brisbane. The Sydney Botanic Gardens are well kept under strict regulations. Even smoking is prohibited. This regulation, although irksome to many, saves the inevitable litter that careless smokers throw about.

The Centennial Park, also under Mr. Maiden, with Mr. Dawes as superintendent, is well worth a visit. The rose garden is beautifully laid out and contains a very large collection of roses. Mr. Dawes also has a fine lot of nymphæs doing well in one of the large lakes. They create a very fine effect when in flower. Avenues of Phœnix canariensis, doing remarkably, add beauty to the landscape. Good displays of flowers in beds also are made. One, a large bed of bouvardias on the main drive, was a picture, the plants being covered with flowers. The park, covering as it does a very large area, is intersected with over 20 miles or roadways that have a smooth tarred metal surface, that makes it a favourite motor car ride.

The Sydney Municipal Council have made great strides of recent years in improving their parks and open places in streets. These latter, not having the generous proportions of the Adelaide or Melbourne ones, cannot be developed to the same extent, particularly with tree planting. Hyde Park is being drastically dealt with by the removal of many of the old Moreton Bay fig trees, and the formation of rockeries, mounds, and flower beds. A beautiful display of Iris Kæmpferi massed together in large beds attracted the attention of thousands of delighted visitors. For gorgeous colourings, particularly in tones of blue and purple, these flowers cannot be equalled. Mr. Ward kindly acted as guide to some of the large private gardens. We were well received and spent an enjoyable time. It rather made me envious that in all the Southern States so many fine private gardens are to be seen, whilst in Brisbane they are practically non-existent. We are worse off now for large private gardens than in former years. Amongst those visited mention must be made of Crow's Nest, Lady Hay's beautiful old home, where Mr. Godwin, a skilled gardener and hybridist, has done so much to improve many old species of plants. His display of Anthurium Scherserianum hybrids in full flower was worth going many miles to see. Mr. Godwin has also raised many orchids and other plants from seed, a number of which have attracted great attention in England. A visit to the garden of Mr. Sayers showed what can be done with what was naturally an almost inaccessible gully. Winding paths, small seats perched here and there, the large collection of plants, grown under natural conditions, give the perfect atmosphere of a true "wild garden."

In conclusion, I desire to say a few words about the suburban gardens. Around Adelaide, Melbourne, and Sydney the suburban gardens are well developed, beautiful cottages homes with fine displays of flowers showing the horticultural taste of the occupiers. These are not met with in isolated instances but in quantity, miles of them. A trip around our suburban districts will reveal that although some of our suburban homes are well supplied with gardens the number is not as large as it should be, and the taste for horticulture needs fostering and developing to a much larger extent than at present. It is the duty of not only the members of this society but all classes to push on this good work. Regarding plants to grow—plant those things that will do well here. Don't try to grow carnations for instance when gerberas will do so much better.

Botany.

THE RED ASH *(ALPHITONIA EXCELSA)*, A VALUABLE FODDER TREE.

By C. T. WHITE, F.L.S., Government Botanist.

Description.—A medium-sized tree; bark on the older trees greyish-black, rough and furrowed; on the younger trees whitish and rather smooth; timber red. Young shoots hoary or rusty with close hairs. Leaves mostly oblong-lanceolate, but varying somewhat in shape, bright green above, white underneath. Flowers greenish-white, usually very numerous. Fruit up to ½-inch in diameter. (Flowering months, February and March.)

The tree can readily be told by the peculiar scent of the young shoots; if these be bruised or snapped off, and the bark peeled from them, they emit quite a distinct odour of sarsaparilla; this scent is quite absent from the older branches and branchlets.

Distribution.—A very common tree in Queensland and New South Wales, found in a wide range of localities, as on ridgy forest country, poor coastal sandstone areas, good forest land, in the inland scrubs, and less commonly on rich basaltic ''scrub'' land. Though most abundant in coastal areas, it extends considerably inland, specimens having been received from as far west as Lochnagar, about 350 miles inland on the Queensland Central Railway. (Coll. W. Johnson.)

Common Names.—It is most generally known as ''Red Ash,'' occasionally as ''White Ash'' or ''White Leaf'' and sometimes under the rather absurd names of ''Silver-leaved Wattle'' and ''Apple Tree''—names that more correctly belong to other trees. It is also quite commonly known colloquially as ''Alphitonia.''

Forage Value.—Wherever this tree is growing and cattle have access to it, the young plants are generally seen to be considerably trimmed down. Some little time back, Prof. H. C. Richards brought me specimens from the Springsure district with the report that Mr. M. Cavanagh, of Vandyke Station, had told him the tree had proved a most valuable fodder during drought periods. In conversation Mr. F. H. Drake informed me that the tree was fairly plentiful in the Central District, and was universally regarded by stockowners as a valuable fodder. In forwarding specimens from the Chinchilla district, Forest Ranger G. Singleton states:—''Grows chiefly in the scrubby country, average size, 6 in. diam., 15-20 ft. high. [Grows much bigger on the coastal country.—C.T.W.] Fairly plentiful in the western scrubs; leaves very good fodder for stock.'' In forwarding specimens from the Texas district, Mrs. H. W. Booth wrote, under date 30th October, 1919:—''The leaves are relished by stock during the present scarcity of other fodders; some people have been felling it, and their cattle seem to thrive on it, looking well even during this extremely dry time.'' Mr. J. Schmeider, of Rosedale, informed me that it was almost impossible to get cattle or horses past it without their having a mouthful, all classes of stock being extremely fond of the leaves.

Botanical Note.—The remarks made and the plate reproduced refer to the commonest Alphitonia that occurs in Queensland, and that seems correctly referable to the typical *A. excelsa*, but several other trees have also gone under that name here which can hardly be referable to the same thing. One of these is very common in the ''scrub'' country of the coast. When the bark is peeled off, even from the trunk and older branches, a very powerful scent of sarsaparilla can be noticed, and on this account the tree is commonly known as ''Sarsaparilla.'' It apparently is confined to the rich ''scrub'' (rain-forest) areas of the east, and often comes up very thickly in practically pure stands after a burn; it, also, is freely eaten by stock. My attention to the difference in these two trees was first drawn by Mr. W. R. Petrie, Forest Officer on Fraser Island. In addition, there are other trees showing further differences. Alphitonia has a wide range beyond Australia, and a complete set of Queensland material has recently been forwarded to the Royal Botanic Gardens, Kew, England, for botanical investigation and comparison with extra-Australian forms.

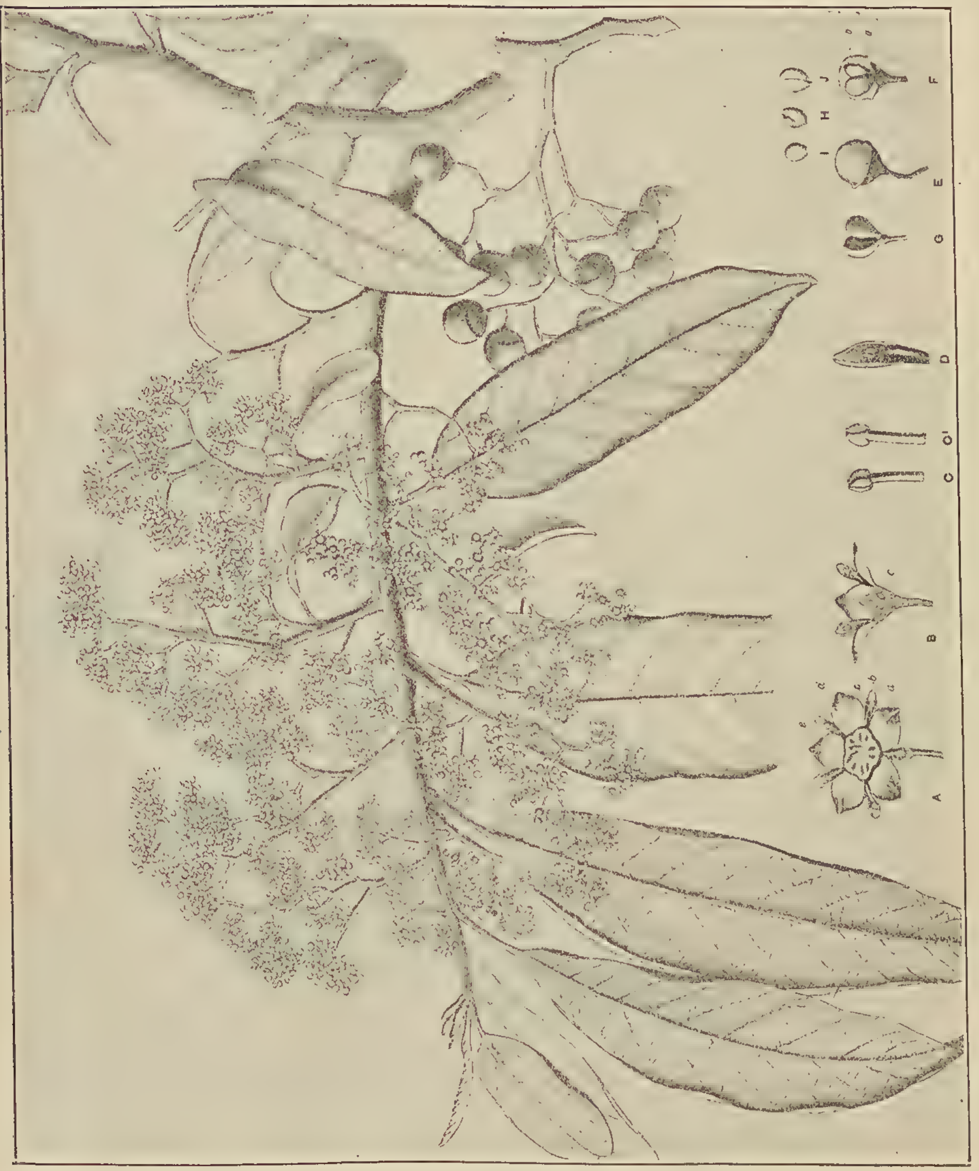


PLATE 16.—THE RED ASH (*Alphitonia excelsa*), Reissek.

A, Flower; B, Longitudinal section of flower; C, Stamens; D, Petal, including the stamen; E, Fruit, showing the rim or cupule; F, Fruit dissected to show the two nuts or cocci; G, The nuts or cocci; H, I, J, Seeds; A-D, Enlarged; E-J, Reduced.—After Maiden, "Forest Flora of New South Wales."

Forestry.

Much as we have, from time to time, written on this most important subject; much as we have learnt from the forestry work of the United States of America and of Europe, and much as our Queensland Department of Forestry has already done and is earnestly doing to conserve to the country an adequate supply of our indigenous timbers, we, in common with the American people, are still a long way from making up for the depletion of our most valuable timbers. What has been done in the past to replace the splendid eucalypti, the Moreton Bay pines, the red cedar, the yellow-wood, the swamp gums, the silky oaks, and the many other useful timbers which abounded in our scrubs and forests from one end of the State to the other less than fifty years ago? Is it not possible to interest the farmers and graziers in this important matter of reafforestation? How easy should it be to plant such trees as are suitable to the various localities, both inland and on the coast, on the boundary lines of their holdings.

How is this matter of forestry considered in the United States of America? The following from the "Pacific Rural Press" is well worthy of our notice:—

"There has never" says that journal, "been a time in the history of California when so many persons were interested so intelligently in the preservation and proper utilisation of our forests. One can hardly open our country newspapers without noticing editorials showing that the recent visits of Gifford Pichot, the capable chief of the Forestry Division at Washington, and some of his assistants, have had an excellent effect in arousing public attention.

"Every farmer should take an intelligent interest in the proper care of our California forests. They should be very dear and near to his heart, and he should think of their management as, after all, based upon the same principle of agriculture which he tries to follow in his own ancient and honourable business. There is certainly a point of view—and one that writers upon forestry topics too often neglect—according to which all the timber lands of the State may be called but a vast wood orchard, a forest farm whose slowly ripening crops are harvested from time to time. Rightly, then, it should be properly sown and properly harvested, at the intervals shown by experience to produce the largest crops.

"Practical forestry is really not unlike practical wheatgrowing, or practical orchard-planting, except that it moves in such long periods of time that it needs the fostering care of governments and strong associations until its requirements are everywhere understood. Everything yields after its nature: the alfalfa field three to five times a year; the wheat annually; the cabbage seed biennially; the tannin-bearing acacias once in ten years; the Douglas spruce forest once in fifty years. There are soils and situations, too, for every different kind of farm crop—and there are immense areas of land which can be used only by planting them to timber crops.

"Suppose that a new continent were to be discovered where wheat grew as abundantly as do our wild grasses, and where excellent apples and apricots hung on the shrubs. If the pioneers of such a land grazed the wild wheat areas, or cut the apricot thickets for firewood, disregarding the laws of higher usefulness and carefully managed reproduction of these crops, the time would soon come when the land would be a barren waste. The law of the wheatfield, that it must be protected and allowed to grow until it is fully ripe and fit for use, is also the law of the century-growing forest, and both alike are shapen to the needs of man.

"It must be because the essential unity of the forester's work, with all correct agricultural practice, is overlooked, that one sometimes finds farmers speaking of the talk about saving the California forests as merely a cry of maudlin sentiment. 'We must have firewood and lumber,' as a man once said to me, and he added: 'You University fellows want to have the Government preserve the forests so that lumber will cost a lot more than it does. All you want is better hunting and fishing.'

"The use of this word 'preserve' has often seemed unfortunate. What we really want is a better utilisation of all our forest resources. What we really mean is that we wish to prevent waste and destruction, to increase the forest supplies, to multiply its manifold uses, and to cheapen in the long-run all its indispensable products. We really mean by 'preserve' and 'protect' exactly what the farmer means when he fences his wheatfield and cultivates his orchard.

"How simple and how reasonable it seems—this utilitarian view of the forests of the State! There is a large portion of California that is worthless for any other purpose except to grow trees and scanty pasturage. It is many times more valuable for growing a timber crop than it is for sheep, goats, or cattle. It is without any other agricultural value. Let us grow timber there, and let us grow it in a systematic and careful way. We can greatly increase the average annual yield of the land; we can have an absolutely safe revenue for all time to come.

''The practical forester says: 'Here are 100,000 acres of mountain land, covered with wild forests. Some of the trees are mature; they will not grow much larger in a hundred years, and so I will sell them to the lumberman. Some of the forest consists of poor kinds, and I will gradually replace those trees with more valuable sorts. In some places I can thin the forest, in others I must have 'mother trees' and let seedlings grow in brave young thickets. In the course of a century, I can very greatly increase the value of this 100,000-acre forest.'

''Because it takes so long to carry out such far-reaching plans, should the farmer who has passed from annual crops to thirty-year rotations of orchards fail to greet the forester as a brother of agriculture?

''The farmer himself will often discover that the right practice of agriculture upon his own farm includes much forestry. He will need a wood lot, or waste and rocky areas can be devoted to the growth of timber. He may possess tan-bark oak, or redwood, or pine, or eucalyptus forests, and here he can apply the same good old principles to protect his crop till it matures, and then to gather in due season its increase—nor need he wait a lifetime in this land of rapid growth.

''As shown by their interest in recent forestry meetings, the leading lumbermen of California recognise the fact that their business depends upon better knowledge of forestry methods. When our forests are destroyed, the lumberman must plant more, at great cost, and wait for many years for them to grow, or else they must go to the Congo and assault Stanley's 'Great Equatorial Forest.' Every thoughtful lumberman knows that he is taking from the future. Now that he better understands the subject, he begins to take a prominent part in forestry organisations.

Farmers should be especially active in every forestry association and public meeting, to secure legislation or congressional action. The farmers of California as well as the lumbermen are vitally interested in the preservation of their forests. Farming cannot long continue in a country whose forests have been destroyed. This side of the subject has been explained in a thousand ways, but its immense practical importance justifies its presentation over and over, until every farmer takes an active interest in forestry topics.

''To sum up this brief paper, forestry is primarily forest study and forest care. The crop of forests consists of firewood and timber. That crop can be increased and made more valuable by employing skilled foresters. The proper management, both governmental and private, should receive the support of the farmers of California, since neglect and ignorance of forest affairs will work such vast and irremediable ruin. Under the conditions of life in this Republic, it is necessary only that enough people shall work together long enough to produce any desirable result. Let the farmers and the lumbermen, therefore, decide to put the management of all our California forests upon a scientific basis.''

RECORD HOOP PINE LOG.

In March last, the following notes on a large pine-tree, felled and logged in the Mary Valley district, were recorded in the Brisbane ''Daily Mail'':—

''The Mary Valley State forests grow some very fine specimens of hoop pine, but seldom produce such a tree as was logged last week. The length of the log was 153 ft., and the girth at the butt 142 in. The quantity of millable timber logged from the tree was 9,355 superficial feet, of which 5,388 superficial feet was first class, and is worth 21s. per 100 superficial feet on trucks, Imbil. The remainder, being knotty, is worth 8s. per 100 superficial feet on trucks. The total value, on trucks, is £72 2s. 4d. Marketing costs amounted to 5s. 3d. per 100 superficial feet. The Forest Service netted £47 11s. 2d. for the tree, the logger and teamster received £24 11s. 2d. for their work. The sawn product will be worth at least £150. While much of the first-class logs will be sawn into valuable wide boards, which will not be used for buildings, the quantity would be sufficient to build a five-roomed dwelling.''

This corroborates the statement by the late Mr. Turnbull, published in the January issue of this journal, that he had seen hoop pine trees in the Mooloolah district having a diameter of from 3 to 6 ft. The tree above alluded to had a diameter of about 4 ft.

Entomology.

2.—THE BANANA WEEVIL *(COSMOPOLITES SORDIDA, Chevr.)*

BY HENRY TRYON, Government Entomologist.

CONSIDERATIONS INFLUENCING METHODS OF REPRESSION.

(*a*) *Traps.*—In the course of a recent visit to certain banana plantations in which the Banana Weevil had become established, it was noted that their proprietors were using portions of the plant of two kinds as so-called "traps," and, in so doing, were following a method fraught with risk of further dissemination of the insect they were endeavouring to exterminate. In fact, the method alluded to ignores the following ascertained habits of the insect in question:—

Any particular weevil that has visited a detached portion of a banana plant, or "trap," may have come from a banana stool adjacent to where this portion has been placed, and may thus itself be evidence of this stool's infestation; but often it is derived from a banana stool growing several yards at least away, and from which it has come in the course of its flight, for it is a flying insect liable to be attracted by the natural odour that attaches to this "trap." Thus, if such portion be placed at the foot of a non-infested stool a few yards distant from an infested one, this non-infested stool—should all the insects visiting this "trap" be captured or not—may, in turn, itself be attacked.

This incident may occur in either of two ways, according to the nature of the portion of banana plant or "trap" used.

This arises from the fact that in visiting any "trap" the weevil may have two purposes in view:—(1) to feed; and (2) (if a female insect) to deposit its eggs and effect its increase.

As regards the "trap," should it consist of a section of the banana stem only, the visiting beetle's first purpose—that of feeding—is alone served, for we have not found that it breeds in such a "trap." And having fed, the female weevil is wont to leave and lay its eggs in any suitable banana plant at hand. On the other hand, should a portion of the corm or root stock form the "trap," it may serve as a place where the beetle (if a female) may lay its eggs also. We have met, not only with eggs, but with grubs in all stages of growth also, in these "traps." Thus may be brought about the presence and development of the weevil in a spot where it was previously absent.

Collecting the banana weevils that have been attracted during successive nights once every morning may reduce the risk of these happenings, but not entirely remove it.

Fortunately, in view of these possible happenings, the insect, on issuing from an infested stool, is evidently not generally in the habit of flying far from the stool from which this took place; and often, if this (the banana stool) be still but little injured or infested, it will return to it, and so fulfil its two requirements already mentioned. Facts, however, indicate that it may on occasion pass unvisited several intermediate stools prior to settling down.

It follows from the foregoing that:—

1. These "baits" should not be used generally outside the area of beetle-borer infestation in any plantation.
2. In employing them, to decide the insects' presence or otherwise and range of occurrence; they should not be laid in or amongst apparently "clean" banana stools growing adjacent to a known infested area; but in this trap-laying a commencement should be made in the neighbourhood of stools growing more or less remote from it, the line of "baits" being gradually moved towards it until serving to attract the beetles.
3. It is preferable when laying the "baits" to place them on the soil between the banana rows, or on tracks traversing the plantation. We have observed that the beetles will visit "baits" on hard, bare roads and on the tops of standing tree-stumps.
4. A portion of a corm or root stock, or of the part of a sucker composed of the same, forms a better "bait" than a portion of a banana stalk; as being more attractive, easier examined with certainty of beetle discovery if present, and longer beetle-frequented.

5. Every "trap" should be examined for beetles once a day, preferably in the early morning, such examination requiring that it be very gently overturned to prevent beetle dislodgment; and the soil on which it has rested receive, too, close attention.
6. The cut surfaces of "traps," if found on this examination to be dry, should be pared, and all should be removed and destroyed after being exposed for two or three weeks at the most, especially if they be not already internally dry.

   Note.—It is not to be inferred that trapping, as alluded to, and the capture thereby of the banana weevils yielded by any infested plantation can result in the destruction of more than a portion of the insects present.

(*b*) *Infestation of Banana "Suckers" or "Sets."*—When these are left upon the ground to dry on being separated-off, and before removal therefrom, to where they are to be planted, the female banana weevil may gain access to them, and then lay its eggs in them as in a "trap." This will happen more especially if such suckers be massed in an open crate and suffered to remain in or near a weevil-infested area.

Accordingly, when to be employed in establishing a new plantation, or in the extension of an existing one, the suckers should be removed before nightfall, on the same day on which they are taken out, and dried-off at some distance from the source. Of course, suckers must not be taken from a known infested area; but the foregoing precaution is demanded even, where infestation of their place of origin is not even at the time suspected, but may nevertheless occur.

(*c*) *Destruction of the Beetle by Starvation.*—A local banana-grower testified in the presence of three witnesses that a number of living beetles contained in a tightly closed glass phial that he displayed had been without food for one month; and scientific testimony would suggest further, that this period, under circumstances often realised, might extend for three months. It will happen then that, should the stools containing or presumed to contain the banana weevil be wholly extirpated and destroyed in any infested area, any beetles ensconced or covered up in the soil, and whether enclosed in fragments of the stool or not, may during many days following such destruction, effect their exit and fly off to banana stools growing more or less near to the place where they have originated. Accordingly, to lessen this migration, "traps" should be at once laid, and their use for same days persisted in, on land that has thus been "cleaned up."

During the mid-winter months, the adult insects or weevil-beetles arise from the pupa (chrysalis) in far fewer numbers than at other times. This, then, is the season for banana-eradication as a controlling measure.

(*d*) *Egg-laying.*—In Note I. on the Banana Weevil ("Queensland Agricultural Journal," xiii., p. 167, Ap., 1920) we have mentioned one site selected for the receipt of the banana weevil's eggs, and also how they are inserted in the plant's tissue. Further observations teach that they may also be laid singly in or on any cut surface of a banana corm, a minute fissure serving often in the former case the purpose of a special puncture. The points of small offsets of the root stock, whilst still beneath the soil surface, as well as the top ends of the corm-portions of the suckers that are known as "peepers" are availed of for the insertion of the eggs by the female beetle in the ordinary way.

The appropriate action, based on these facts, that is called for, is obvious.

REPORT, BUREAU OF SUGAR EXPERIMENT STATIONS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon "Cane Grub Investigation" from the Entomologist, Dr. J. F. Illingworth:—

Continued dry weather is telling seriously upon the cane crop, in the region about Meringa. This particular spot appears to just miss all the good showers that occur further up the line. Even the cane at Greenhills, which is usually well advanced at this season, still has to be chipped and cultivated, for it is not covering the ground. Cutting will necessarily be late and the crop short.

As has long been recognised, the cane grubs are most destructive to the crop during periods of drought. I have never seen the pest more abundant at Greenhills; and, though the grubs are still small, the tops of the cane are beginning to show the drying effects, brought about by the cutting off of the feeding roots.

As indicated in last report, I was compelled to limit my experiments with arsenic to ratoon crops; the results, which are just beginning to develop, are not proving very satisfactory, as will be explained later on. The same may be said in regard to the application of Muscardine fungus.

DEVELOPMENT OF *LEPIDIOTA ALBOHIRTA* (GREY-BACKS).

As has been described the beetles emerged very late at Greenhills—in fact, almost two months after their usual occurrence—and they have continued to emerge, so that even now (15th March) beetles with undeveloped eggs are still to be found on the feeding-trees; and we frequently uncover clusters of the newly laid eggs in digging for grubs. Moreover, some of the eggs that were laid by the first beetles have already developed into grubs of the third or final stage; hence we now find every condition of the life-history represented in the soil—eggs, first, second, and third stage grubs, with beetles ovipositing.

The first newly hatched grubs that we were able to locate this season, by digging, was on the 18th of February. At that time I also took a beetle in the soil, from which I squeezed twenty-seven ripe eggs. It will be recalled that this species has the habit of placing the whole egg-cluster in a well-formed cell about 5 or 6 inches below the surface.

Recent observations indicate that it is the usual practice of the beetle when flying to the cane to come to rest on the stalk; and, later, to crawl directly down and enter the soil at its base. This habit results in the placing of the egg-cluster in a most favourable position, especially in the case of ratoon cane, for they are out of reach of cultivation, and the grubs develop undisturbed. Investigation during the past month leads me to conclude that, especially during dry weather, the young grubs do little migrating if hatched in old ratoon stumps, for they are best protected there against drought, and they have an abundance of food in the form of decaying organic matter from the old roots and seed-cane. These observations will be referred to again, for they help to explain the unsatisfactory results with arsenic.

By 3rd March, about 10 per cent. of the grubs had reached the second stage, though the beetles were still abundant on the feeding-trees. It may be remarked that these grubs in growing shed their skins three times; after each moult the hard parts of the head are noticeably larger—of almost a standard size, with no regard to the size of the body. Hence, it is an easy matter, with a little experience, to sort the grubs, as to size of the head, into the various stages.

On 15th March, we found a few of the grubs had already reached the third stage; about 50 per cent. were still in the first—many just hatching; while the remainder, somewhere between 40 and 50 per cent., had changed to the second stage.

LEPIDIOTA FRENCHI—INCREASING ACTIVITIES.

As is now known, this species has a two-year life-cycle; hence the beetles are more numerous alternate years, and the grubs are never noticeable the season following the big emergence of the beetles. It is during their second year in the soil that the full-grown grubs (third stage) are so destructive. They feed on the roots from September to May, thus doing their worst injury to the cane before the eggs of the Grey-backs are laid.

In the region about Gordonvale, this is the year for trouble from the grubs of this species, and we may expect a big emergence of the beetles in December, or as soon as the rains set in.

This pest, formerly restricted more to grass lands, is becoming increasingly abundant in cane areas; I have never seen them worse than now. They are spreading rapidly, too, to sections formerly considered immune; and in some places they appear to be displacing the Grey-backs. They certainly require immediate investigation, for their habits differ materially from those of the ordinary cane grub.

The beetles apparently prefer to feed on low bushes, and probably are able to oviposit much sooner, with greater numbers of eggs. They certainly are much swifter in flight, and probably go longer distances. At any rate, we find the grubs destroying cane far removed from any possible feeding-trees. It is just possible that they may be able to oviposit without food, where feeding-trees are unavailable. This is true of *Anomala orientalis*, in Hawaii, which normally lays its eggs even before emergence from the soil. They are able to do this because the grubs store up a quantity of food, in the form of fat, before pupating and changing to the adult beetles.

ARSENIC FOR CONTROL.

Undoubtedly if arsenic can be placed in the soil right where the grubs are feeding it will quickly destroy them, as I have demonstrated by laboratory experiments. At the same time, the poison does not appear to in any way injure the cane.

Under field conditions, however, difficulties are met with, but I trust these may be overcome as we become better acquainted with the habits of the pest. In our experiments this season with ratoons, the best procedure that suggested itself was placing the poison in drills as near the sides of the stools as possible; where, it was hoped, the grubs would find it as they began to move about, soon after hatching. Under prevailing drought conditions, however, this has not worked out successfully. The young grubs have not migrated; on the contrary they have stuck close within the stool where they hatched, thus securing better conditions of moisture and food.

Theoretically, the best method of application would be to place the poison in the drill with the plants; preferably on the soil after they are covered. In this way it would have a tendency to work downward during cultivation, and be right among the roots at the time that the grubs hatched. It was my intention to use this method last season, had the drought not curtailed late planting. I had a good-sized field laid out at Greenhills for the purpose; hoping to determine, also, the amount of poison necessary.

On two other farms, near Gordonvale, arsenic has been applied extensively during the past season. On one, where used with ratoons, there is the same lack of success that we have experienced. On the other hand, Mr. R. Blackwell, on the Riverstone road, used arsenic in the drill with meatworks manure when planting last June. He mixed the poison at the rate of about 20 lb. for each bag of the meatworks, and applied about 5 cwt. of the manure per acre, hence about 70 lb. of the poison. This is the same amount that was used by Mr. C. E. LaCaze in his successful experience in the control of grubs on the Herbert River years ago.

It is pleasing to note that this cane of Mr. Blackwell's is as fine as any in the district, being far in advance of anything that I have seen recently. Here, again, we must not jump at conclusions, however, for he treated the whole field, without leaving checks.

Mr. Blackwell told me, however, that the cane in this area had suffered severely from grubs before, hence his decision to apply the arsenic. Furthermore, the ratoons on a nearby field are now showing grub-injury, which we found was due to the activities of *Lepidiota frenchi.*

POULTRY DESTROYING BEETLES.

It has been noticeable for a number of years, on the Greenhills Estate, that the cane for several chains on either side of the barracks is practically free from grubs. This is a point worthy of attention, since the camp is situated in the midst of the worst-infested fields.

Following upon the observation that the egg-laden beetles rest for some considerable time upon the cane plants, after their flight at daybreak before attempting to enter the soil to oviposit, is it not credible that the fowls about the camp, feeding upon the beetles, might so deplete their numbers as to give the result? Fowls are very early risers, and by two hours' active search, a large flock could clear a considerable area.

I shall be interested for any evidence along this line from growers who have cane adjoining the farmyard.

MUSCARDINE FUNGUS FOR CONTROL.

Though grubs destroyed by this fungus are often found abundantly in certain fields, under favourable conditions, it apparently cannot be depended upon as an important controlling factor.

Recent experiments in treating grub-infested soils with pure cultures have been very discouraging. In no case have I been able to find diseased grubs in the treated plots. In all probability this is due to the abnormally dry conditions prevailing. We found by laboratory experiments with the fungus on grubs, that mortality was greatest under moist, cool conditions, so probably epidemics occur only when weather conditions are favourable.

From time to time we dig up grubs that have been killed by this fungus, at Greenhills, thus indicating that the spores are present in the soil and continue from year to year. Even grubs in the first stage succumb to the disease, as I have observed recently.

MERINGA PLOTS.

Located on the highest ground, these experimental plots have suffered extremely from the unfavourable weather conditions. To begin with, there was much delay in getting the cane cut, so that many of the stools were sapped out and allmost dead before the ratooning was started. Then, too, in several of the plots there is injury caused by the grubs of *Lepidiota frenchi.* Furthermore, the field is not fenced, and considerable areas have been devastated by stray stock.

Altogether, there is little to be expected from this area, unless we have a long-continued rainy season, which is not now in prospect.

General Notes.

SOCIETIES, SHOW DATES, ETC.

BOWEN.—The Annual Show of the Bowen Pastoral, Agricultural, and Mining Association will take place on 1st and 2nd July, 1920.

KILKIVAN.—The annual show of the Kilkivan Agricultural, Pastoral, and Industrial Society, set down for 26th and 27th May, has been postponed to later in the year, owing to the adverse season.

MARYBOROUGH.—The Wide Bay and Burnett Pastoral and Agricultural Society's fifty-second annual show will be held on the 8th, 9th, and 10th June, 1920.

PALMWOODS.—The Palmwoods Fruit Growers' Association. Sec., Mr. W. Browne.

TOOGOOLAWAH.—Toogoolawah Dairying and Industrial Association, second or third week in August.

TO PREVENT THE STAGNATION OF WATER.

In reply to a correspondent, Mr. J. C. Brünnich, Agricultural Chemist, to whom the question was submitted, advised as follows:—

"As a rule, growth of green algae does not cause the water to become stagnant, but if the growth is too rapid, it may be prevented by addition of very minute amounts of copper sulphate. The quickest method is to put a few handfuls of copper sulphate crystals in a muslin bag and drag it a few times backwards and forwards in the lagoon; repeat if necessary after a few days. Only small amounts are required; large amounts used would be poisonous."

RARE SUGAR FOUND IN HONEY.

In the March issue of the Journal, we made reference to the occurrence of a rare and valuable sugar found, as stated in the "Weekly News Letter," Washington, U.S.A., in honey. The Hawaiian "Forester" for February, 1920, also draws attention to this substance as being rare, and in great demand for use in scientific laboratories under the name of Melezitose. It is suggested that it formed one of the constituents of the manna of Scripture. Some years ago a sugary, crystallised, whitish substance fell at a certain season from some member of the Eucalyptus family, and adults, as well as young people, used to collect a sugary substance therefrom lying on the grass. Might this have been the same sugar?

ANALYSES OF MANGO KERNELS.

Mr. W. Robertson, of The Hollow, Mirani, near Mackay, recently wrote to the General Superintendent of the Bureau of Sugar Experiment Stations, stating that he had an idea that mango kernels might contain good food for pigs, either raw or boiled, and asked that an analysis might be made. This was carried out by the Agricultural Chemist, Mr. J. C. Brünnich, with the following results:—

Moisture	48.39	per cent.
Crude Protein	3.15	"
Carbohydrates	42.06	"
Crude Fibre	.57	"
Crude Fat	4.53	"
Crude Ash	1.30	"

Of the whole seed, the kernel represented 66.7 per cent. and the husk 33.3 per cent.

The Agricultural Chemist remarked:—"From the analyses it appears that mango kernels, which represent two-thirds of the weight of the seed, have a very good feeding value, equal to that of a good quality of hay."

Answers to Correspondents.

SULPHUR AND LIME AS A FERTILISER.

J. H. Barber, Crow's Nest—

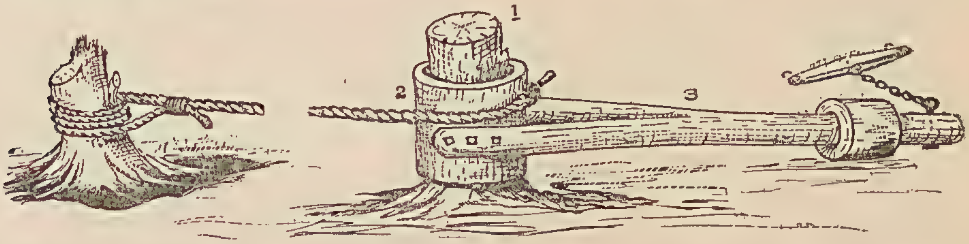
In reply to your letter, Mr. J. C. Brünnich, Agricultural Chemist, advises: "In my pamphlet 'Complete Fertilisers' I mentioned that flowers of sulphur have been reported to act as a fertiliser. The value of lime is well recognised. The question of sulphur buried in the ground acting on insect pests is quite problematical."

AN EFFECTIVE STUMP EXTRACTOR.

New Selector, Herberton—

In reply to your inquiry concerning a cheap stump extractor, there are several fairly cheap machines on the market, amongst which are the very reliable and powerful grubbers manufactured by Messrs. Trewhella Bros.; Brisbane agent, A. Robinson, 549 Queen street, Brisbane. See advertisement in the "Queensland Agricultural Journal," p. xxiii.

Some years ago, Mr. John Morgan, of Mount Berryman, sent us the sketch here reproduced of a remarkably simple, cheap, and effective stump extractor, which was worked by one horse.



A 12-inch drum is bolted to a forked sapling, and is slipped over a handy stump, round which it works. No tackle is required. A wire rope with a piece of chain at the end are all that is required. The pole is 10 feet long. The wire rope is made fast to the drum, and the other end passes round the stump to be extracted. No knot is used. As the horse moves round, a force of 20 tons is thus exerted, and no difficulty is experienced in dragging out very large stumps. The tackle can also be used on standing timber, care being taken to so arrange, by means of a tackle, that the tree falls away from the horse.

The drum may be made in two halves, to avoid lifting over a stump. The halves are simply placed against the stump around which it works, and are bolted together. The cost of the whole outfit would only be about £2. One man and a boy, it is stated, can stump half an acre a day with the machine. Such a contrivance should prove very useful on a scrub farm, as there are large numbers of scrub trees which have no tap root. In former days all scrub stumping was done with mattock and axe, which was slow and laborious work.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1920.

Article.		APRIL
		Prices.
Bacon	lb.	1s. 5d.
Bran	ton	£9 to £13
Broom Millet	„	£40 to £60
Broom Millet (Sydney)	„	£60 to £70
Butter (First Grade)	cwt.	200s. 8d.
Chaff, Lucerne	„	11s. 3d. to 17s.
Chaff, Mixed	„	11s. to 13s.
Chaff, Oaten	„	13s. to 14s.
Chaff, Wheaten	ton	£9 to £13 15s.
Chaff, Sudan Grass	„	£13 to £13 5s.
Cheese	lb.	1s.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 10½d.
Hay, Lucerne	ton	£14 5s.
Hay, Oaten	„	...
Honey	lb.	5d. to 7½d.
Maize	bush.	10s. to 11s. 6d.
Oats	„	...
Onions	ton	£10 to £22
Peanuts	lb.	7d. to 10½d.
Pollard	ton	£10 to £12 10s.
Potatoes	„	£12 to £14
Potatoes (Sweet)	„	£5 10s. to £13.
Pumpkins (Cattle)	„	£7 to £15
Eggs	doz.	2s. to 3s. 4d.
Fowls	per pair	3s. to 8s.
Ducks, English	„	5s. 6d. to 6s.
Ducks, Muscovy	„	5s. 6d. to 8s.
Geese	„	10s. to 13s.
Turkeys (Hens)	„	10s. to 15s.
Turkeys (Gobblers)	„	17s. 6d. to 35s.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	6s. to 16s.
Beetroot, per dozen bunches	...
Cabbages, per dozen	5s. 6d. to 24s.
Carrots, per dozen bunches	1s. 9d. to 3s.
Cucumbers, per dozen	3d. to 1s. 9d.
Lettuce, per dozen	9d. to 1s. 6d.
Marrows, per dozen	2s. to 7s. 6d.
Peas, per sugar-bag	10s. to 16s.
Potatoes (Sweet), per sugar-bag	6s. to 6s. 9d.
Pumpkins (table), per sack	8s. to 13s.
Tomatoes, per quarter-case	2s. to 5s. 6d.
Turnips(Swede), per sugar-bag	1s. 6d. to 2s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	APRIL.
	Prices.
Bananas (Queensland), per double-case	...
Bananas (Tweed River), per double-case	14s. to 26s.
Lemons, per bushel-case	9s. to 16s.
Mandarins, per case	4s. to 15s. 6d.
Oranges (Second Crop), per bushel-case	4s. to 13s. 6d.
Pineapples (Queens), per double-case	9s. to 14s.
Pineapples (Ripleys), per double-case	8s. to 14s. 6d.
Pineapples (Common), per double-case	3s. 6d. to 8s.
Tomatoes, per quarter-case	3s. 6d. to 8s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	13s. to 15s. 6d.
Apples, Cooking, per bushel-case	11s. to 14s.
Bananas (Cavendish), per dozen	2d. to 8½d.
Bananas (Sugar), per dozen	4½d. to 7d.
Citrons, per cwt.	10s. to 15s.
Cocoanuts, per sack	£1 5s.
Custard Apples, per half bushel-case	5s. to 10s.
Grapes, per lb.	3d. to 9d.
Lemons (Lisbon), per half bushel-case	3s. 6d. to 15s.
Mandarins, per case	11s. to 18s.
Mangoes, per case	3s. to 11s.
Oranges, per half bushel-case	10s. to 16s.
Papaw Apples, per quarter-case	2s. to 12s.
Passion Fruit, per half bushel-case	2s. to 15s.
Peaches, per quarter-case	...
Pears	12s. to 16s. 6d.
Persimmons, per quarter-case	2s. 9d. to 5s. 6d.
Pineapples (Rough), per dozen	3s. to 10s.
Pineapples (Smooth), per dozen	5s. to 8s. 6d.
Pineapples (Ripley), per case	8s. to 10s.
Tomatoes (prime), per quarter-case	2s. to 5s. 6d.

TOP PRICES, ENOGGERA YARDS, MARCH, 1920.

Animal.	MARCH.
	Prices.
Bullocks	£19 12s. 6d. to £24 10s.
Bullocks (Single)	£27 10s.
Cows	£14 17s. 6d. to £18 2s. 6d.
Merino Wethers	45s. 9d.
Crossbred Wethers	46s. 6d.
Merino Ewes	36s.
Crossbred Ewes	66s. 6d.
Lambs	35s. 6d.
Pigs (Backfatters)	£7 10s.
Pigs (Light Bacon)	£4 15s.
Pigs (Porkers)	64s.

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Grasses, Clovers, Lucerne, Rape, Swedes, and Turnips, Sheep's Burnet, Mangels, and all Farm Seeds and Fodder Crops. Special Fodder Circulars issued each Season. Send your name and address and we will forward copies to you.

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Poa Aquatica

The King of Swamp Grasses

A tall, perennial, reed-like grass, growing to a height of 6 ft. Like most grasses with creeping roots, it is easily propagated by planting out, which is effected very simply by throwing roots into shallow water. With swamps that hold the water all the year round, it would be difficult to find a more suitable grass, for the amount of pasture it produces is extraordinary. Dairy Cattle are particularly fond of POA AQUATICA, and on Dairy Farms with swampy ground, considerable quantities have been established to great advantage. Cattle will walk right into the swamps, right up to their bellies, to get it. It not only affords rich pasturage in Summer, but forms the chief part of Winter Fodder, and will give immediate results in both Summer and Winter growth. Without doubt, one of the best feed grasses yet introduced. Only obtainable in roots, £2 per sack. **We are the Sole Distributors.**

"Mortgage Lifter" Oat

This new Oat grows to a height of 6 feet, and has yielded from 90 to 100 bushels to the acre. One grower reports very satisfactory results, obtaining 61 bushels in spite of a very dry season. Graded, re-machined, clipped, and tailed, 10/6 bushel; 9/6 bushel in sack lots; 9/- bushel in 5-sack lots; f.o.b. Melbourne.

Ruakura Rust Resisting Oat

Extremely rust-resistant, and a very good cropper. Slightly grey in colour, the Oat is thin skinned, and of fine quality, the bushel weight—the true test of value—being 46 lbs. The heavy-weighing Oat has naturally a good kernel. Price, 10/6 bushel; 9/6 bushel in sack lots; 9/- bushel in 5-sack lots; f.o.b. Melbourne.

Lucerne, the King of Fodder Crops.

Lucerne will fatten Cattle, Sheep, Pigs, etc., better than any other feed and with less expense. All our Lucernes are specially machine-cleaned, hand-sieved, free from dodder, and true to name, and have passed the Government Test. HUNTER RIVER LUCERNE—great scarcity of this splendid variety. Book your order now. Demand exceeds supply. Prices on application.

Paspalum Dilatatum.

A valuable grass for all stock, particularly suitable for Dairy Cattle. Withstands drought; stands any amount of grazing.

Paspalum Distichum.

An aquatic grass, growing to perfection on flooded flats. Has great carrying capacity; stock relish it and put on condition quickly. Easily grown from roots. Price, 35/- a bag.

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Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or, at the earliest, in warm, early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist Spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave plants (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frosts, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth and that weak, so that the fruit produced thereon is small, it is advisable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to over-produce fruit spurs, which become long and straggling, and bear a large quantity of small-sized fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark, in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5 0	6·39	5·3	6·30	5·18
2	6·14	5·15	6·32	5·0	6·40	5·4	6·29	5·19
3	6·15	5·15	6·33	4·59	6·40	5·4	6·29	5·19
4	6·15	5·14	6·33	4·59	6·40	5·4	6·28	5·20
5	6·16	5·14	6·33	4·59	6·40	5·5	6·27	5·20
6	6·17	5·13	6·34	4·59	6·40	5·5	6·27	5·21
7	6·17	5·12	6·34	4·59	6·40	5·5	6·26	5·21
8	6·18	5·12	6·34	4·59	6·40	5·6	6·25	5·22
9	6·18	5·11	6·35	4·59	6·40	5·6	6·24	5·22
10	6·19	5·10	6·35	4·59	6·40	5·6	6 23	5·23
11	6·19	5 9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·8	6·36	5·0	6·39	5·7	6·22	5·24
13	6·21	5·8	6·36	5·0	6·39	5·8	6·21	5·24
14	6·21	5·7	6·36	5·0	6·39	5·8	6·20	5·25
15	6·22	5·6	6·36	5·0	6·38	5 9	6·19	5·26
16	6·22	5·6	6·37	5·0	6·38	5·9	6·18	5·26
17	6·23	5·5	6·37	5·0	6·38	5·10	6·17	5·27
18	6·23	5·5	6·38	5·0	6·37	5·10	6·16	5·27
19	6·24	5·4	6·38	5·0	6·37	5·11	6·16	5·28
20	6·25	5·4	6·38	5 0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·39	5·0	6·36	5·12	6·14	5·28
22	6·26	5·3	6·39	5·0	6·35	5·13	6·13	5·29
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	2·27	5·3	6·39	5·1	6·34	5·14	6·11	5·30
25	6·28	5·2	6·39	5·2	6 34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·2	6·33	5·15	6·9	5·30
27	6·29	5·2	6·39	5·2	6·33	5·15	6·8	5·31
28	6·29	5·1	6·39	5·3	6·32	5·16	6·7	5·31
29	6·30	5·1	6·39	5·3	6·32	5·16	6 6	5·32
30	6·30	5·1	6·39	5·3	6·31	5·17	6·5	5·32
31	6·31	5·1	...	...	6·31	5·17	6·4	5.33

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria).

		H. M.
3 May	○ Full Moon	11 47 a.m.
11 „	☽ Last Quarter	3 51 p.m.
18 „	● New Moon	4 24 p.m.
25 „	☾ First Quarter	7 7 a.m.

Apogee on 7th at 6 a.m. Perigee on 19th at 4 p.m. The Moon will be totally eclipsed on the 3rd at midday, but will not be visible in Australia. It will cause a partial eclipse of the Sun on the 18th, visible in parts of Queensland about sunset.

2 June	○ Full Moon	3 18 a.m.
10 „	☽ Last Quarter	4 58 a.m.
16 „	● New Moon	11 41 p.m.
23 „	☾ First Quarter	4 49 p.m.

Apogee on 3rd at 2·30 p.m. and on 30th at 5 p.m. Perigee on 17th at 1·12 a.m. The Moon will occult Mars and Spica on the 25th, not visible in Australia unfortunately, but on the 28th the occulation of a small star in the Scorpion about 6 p.m will be an interesting sight in small telescopes and binoculars.

1 July	○ Full Moon	6 41 p.m.
9 „	☽ Last Quarter	3 5 p.m.
16 „	● New Moon	6 25 a.m.
23 „	☾ First Quarter	5 20 a.m.
31 „	○ Full Moon	9 19 a.m

Perigee on 15th at 10·24 a.m. Apogee 28th, 12·24 a.m.

7 Aug.	☽ Last Quarter	10 50 p.m.
14 „	● New Moon	1 44 p.m.
21 „	☾ First Quarter	8 52 p.m.
29 „	○ Full Moon	11 3 p.m.

Perigee on 12th at 3·48 p m. Apogee on 24th at 2·36 p.m. On the 8th and 9th of August the planets Venus and Jupiter will appear to be in juxtaposition, but will be too near to the Sun to be seen to much advantage without a telescope or binoculars. They will be about ten degrees south-east of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

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RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1920.	Mar., 1919.
North Coast.	In.		In.	In.
Atherton	8·64	19	1·02	5·99
Cairns	18·14	38	6·96	6·23
Cardwell	16·59	48	5·68	3·82
Cooktown	15·00	44	3 52	8·63
Herberton	8·22	33	1·86	2·71
Ingham	16·57	28	8·09	5·62
Innisfail	27·18	39	8·01	13·99
Mossman	18·92	12	9·07	5·11
Townsville	8·11	49	1·86	1·95
Central Coast.				
Ayr	7·58	33	1·55	3·07
Bowen	5·98	49	0·61	3·06
Charters Towers ...	3·66	38	1·17	1·80
Mackay	12·50	49	2·45	4·45
Proserpine	12·30	17	5·75	6·61
St. Lawrence ...	6·21	49	0·25	2·41
South Coast.				
Biggenden	4·46	21	1·55	2·71
Bundaberg	5·72	37	1·72	5·37
Brisbane	5·86	69	1·80	6·02
Childers	5·34	25	2·18	4·46
Crohamhurst ...	12·24	27	4·15	11·25
Esk	5·00	33	2·31	6·29
Gayndah	3·31	49	2·32	4·94
Gympie	6·41	50	2·31	5·60
Glasshouse M'tains	10·00	12	2·52	9·29
Kilkivan	4·16	41	0·52	4·25
Maryborough ...	6·52	49	2·24	4·97
South Coast— continued:	In.		In.	In.
Nambour	9·85	24	6·10	8·87
Nanango	3·42	38	1·28	4·93
Rockhampton ...	5·21	33	1·61	3·13
Woodford	8·40	33	1·85	5·92
Darling Downs.				
Dalby	2·84	50	0·62	1·80
Emu Vale	2·81	24	1·90	5·62
Jimbour	2·73	32	0·74	3·34
Miles	2·86	35	0·45	1·61
Stanthorpe ...	2·84	47	2·03	6·55
Toowoomba ...	3·99	48	1·25	5·25
Warwick	2·96	33	1·49	5·31
Maranoa.				
Roma	2·91	46	0·29	1·20
State Farms, &c.				
Bungeworgorai ...	1·85	6	0·59	1·02
Gatton College ...	3·63	21	1·88	5·35
Gindie	3·02	21	2·06	0·15
Hermitage ...	2·87	14	1·34	5·65
Kairi	5·20	6	1·58	3·36
Sugar Experiment Station, Mackay	11·73	23	2·04	1·92
Warren	2·61	6	5·95	0·87

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1919, having been compiled from telegraphic reports, are subject to revision.

J. H. HARTSHORN, Acting State Meteorologist.

QUEENSLAND AGRICULTURAL JOURNAL

Vol. XIII. JUNE, 1920. Part 6.

Agriculture.

TOBACCO-GROWING IN QUEENSLAND.

We have received the following interesting letter from a correspondent at Newmarket road, Windsor, Brisbane (who writes under the *nom de plume* ''Vuelta Abajo''), on the subject of the cultivation of tobacco in Queensland. We have frequently, in the past, devoted considerable space in this Journal to advocating the extension of tobacco-growing by farmers in districts where conditions are such as to offer every prospect of success, as at Texas (Q.), Bowen, and Cardwell, where a considerable quantity of pipe tobacco was grown in the first-named district, and cigar leaf in the North. What was then wanting to growers was a knowledge of the best way of preparing the leaf for market. The curing houses were mere sheds with no appliances for regulating the temperature. It was only when the Department of Agriculture took the matter in hand and engaged the services of Mr. R. S. Nevill, an American planter, with long experience in the business, that more suitable methods of cultivation, choice of soils in different districts, and the building of up-to-date curing houses at Texas, were undertaken; and that, under his management, the industry was extended and promised to become very profitable to tobacco-growers in suitable localities. In 1912, Mr. Nevill, in his farewell report for the year 1912-1913, made it clear that he regarded tobacco as the most profitable of all small crops, and saw no reason why Queensland should not supply the whole need of Australia, which was then equal to 15,000,000 lb. a year. The area under tobacco in the whole State in 1911 was 592 acres, and the produce of dried leaf was 476,532 lb., and in 1912 the acreage had increased to 692 acres, but owing to a severe drought, the dried leaf only totalled 241,969 lb., the average being only 350 lb. per acre as compared with 1,000 lb. and over in 1904-5-6 and 1910.

The value of an acre of tobacco was then about £30. The quantity of manufactured plug and cut tobacco made in Australia was 10,041,339 lb., which took 8,546,726 lb. of leaf, of which no less than 7,339,611 lb. was imported from abroad.

To come to later years, we see a woeful falling off in the industry in 1918, the total area under this crop being 213 acres only, of which 172 acres were in the Inglewood and Texas districts. The Bowen district showed a decrease from 34 acres of cigar leaf to 12 acres only in 1918.

Whatever may have been the cause of this serious fall in the tobacco industry, it is undoubted that good tobacco can be grown in Queensland. Everyone admits that the cultivation of the ''weed'' is profitable to the grower, and although Europeans have been attracted to it, the cultivation on the whole has been in the hands of the Chinese, and apparently, the time has not yet come when the European population will take a liking for its cultivation.

There is no want of a good market for good leaf, and prices have been offered by the manufacturing firms (Messrs. W. D. and H. O. Wills Ltd., and the British Australasian Tobacco Company) at from 6d. per lb. to 2s. 6d. per lb. for the different qualities. The annual quantity of cured leaf required by these firms is about 2,000,000 lb. At one time a bonus of 2d. per lb. for cigar leaf was given by the Commonwealth Government, which was afterwards discontinued. Any future bonus if given should certainly include pipe tobacco.

Our correspondent writes:—"As there is no doubt about the present being an opportune time, I crave space in the 'Agricultural Journal' in order to arouse interest in tobacco. A great deal of publicity has recently been given to the cultivation of cotton, castor-oil bean, flax, &c., but scarcely anything has been said about tobacco. In my opinion it is a crop of great importance, considering the facts that it thrives well in Australia and that such a large quantity is imported. The quantity of leaf produced from the Bowen district is from 20,000 to 40,000 lb. per annum, varying according to the season experienced.* From the Texas district it is about 60,000 or 70,000 lb. The quantity of leaf only, imported by Australia from the United States of America alone was 17,793,685 lb., valued at 8,583,010 dollars (about £1,716,000) for the year ending 30th June, 1919. This need not be if scientific and up-to-date methods are adopted in the production of Australian leaf, and a sufficient quantity produced to meet the requirements of Australian manufacturers.

"In the Bowen district, which produces a cigar-leaf, practically only one class of leaf is produced. It is from the Zimmer Spanish seed introduced about twenty years ago. The quality of some of the leaf, reproduced after all those years from seed reserved from season to season, without scientific selection, can be well conjectured by those who know anything about tobacco. Whatever may be said in favour of the Zimmer Spanish, it cannot be placed at the top as a cigar-leaf. Experiments should be made with other seed, and the stocks thus obtained from adaptable varieties would enable the district to produce better tobacco. Some time ago, whilst at Proserpine, I made available to the growers a list of varieties, which, in my opinion, would be suitable to the North Queensland cigar-leaf belt. Of course, it is rather difficult to say offhand whether they would, but they should certainly be tried out. Attempts have been made with the Sumatra, but so far the leaf produced from imported Sumatra seed does not compare with the Sumatra as known to cigarists. It should be remembered that tobacco is remarkable for the readiness with which it is modified by the soil and climate of the locality in which it is produced. Not only are the size and texture of the leaves greatly affected, but the quality, the strength, the flavour, and sometimes the colour (when cured), are changed to a remarkable extent. The plant after a few successive years in any locality assumes the characteristics and becomes of the quality peculiar to the tobacco of that district.

"In the districts which produce leaf for the manufacture of general smoking tobacco (pipe, cigarette, and chewing), there is scope for considerable improvement. The system of 'flue'-curing should be adopted as far as possible, and higher prices will result. The production of this leaf has largely been in the hands of Chinese, and their methods have been too well copied by whites. I might point out that there is one 'flue' in Australia, owned by Mr. Aitken, of Gunnedah, New South Wales. He has a large area under tobacco, and turns out a very nice leaf. The object of the 'flue' is rapid drying, retention of the natural aroma, and minimising the cost of handling the crop after harvesting. Proper manipulation of the 'flue' ensures the colours which grade high at the factory.

"Not too much fault can be found with Australian cultural methods. It is in the handling of the crop after harvesting, the housing of the crop, and preparing for market by grading, and by 'bulking,' 'sweating,' or 'conditioning,' that the Australian planter is very much behind the times. This part of the business needs a chapter to itself.

"Tobacco as a crop is an ideal one for the farmer, and is in the front rank of money makers. One acre will yield 1,000 lb. leaf (U.S.A. average), and if sold for an average price of 2s. per lb., makes a good return per acre. The yield can be increased by scientific cultivation and seed selection. Mr. Otto Olsen, of the Pennsylvania Department of Agriculture, has succeeded in producing the 'Slaughter' strain, which goes over 2,000 lb. per acre, and the bulk of the trial crop was wrapper grade. It is the general rule that the higher the yield the better the quality of the leaf. Special qualities of leaf fetch a high price. For instance, Hanover 'brights' (Virginia), sold for over a dollar per lb. last November. High grade cigar wrappers (shade grown) realise as much as 6 dollars per lb. Last year the Australian tobacco

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The Annual Report of the Department of Agriculture and Stock for 1918-1919 gives the return of Tobacco in the Edgecombe Division of the State, which includes Bowen, Proserpine, and Townsville, as 10,615 lb., 9,888 lb., and 5,036 lb. respectively.—(Ed. Q.A.J.)

companies made an offer to the Commonwealth Board of Trade to purchase 2,000,000 lb. weight of Australian-grown flue-cured tobacco each year for three years, starting from the date when the first year's crop is marketable. The prices offered range from 6d. to 1s. per lb. for bright and dark, 1s. 6d. for dark, 2s. for bright mahogany, and 2s. 6d. for lemon colour. The acting president of the board stated that those prices were highly satisfactory from the grower's point of view. Queensland cigar leaf fetches about 2s. 6d. per lb. (firsts) in Melbourne.

''Compared with cotton, about which a lot of publicity has recently been given, tobacco stands very favourably. Major Glessner, a prominent agriculturist of Georgia, U.S.A., and an authority on both crops, is of the opinion that tobacco beats cotton. In an address to the planters of Georgia he said:—'When a man told me how much his tobacco farming cost him, I asked him how much better his cotton was doing, and how much more he got out of it? He was obliged to admit that the prospect was, that his cotton would bring him less and take three times as long to find it out. When he talked of how much his tobacco houses and experience had cost him, I asked him was he going to throw both away? The only way to come out well is to plant tobacco again, and capitalise on both barns and experience. No man ever stopped growing cotton because one year's crop was a failure, or the market unsatisfactory. As a usual thing they increased their crops the next season, and never thought of abandoning their efforts until the boll weevil put them out of business. It is my opinion, after careful investigation, that the grower should stick to tobacco as a safe crop, and one that will in the long run bring more profit than cotton ever did.'

''I do not contend by any means that cotton culture should not be taken up in this country—quite the contrary. In the Southern States (U.S.A.) both crops are very often cultivated side by side, and it would be a splendid thing if we do likewise. A great deal can be said on the merits of these two valuable crops. Tobacco is essentially a dry-weather crop—an important thing in its favour in this country.

''I would like to add something on general cultural methods, seed selection, tobacco houses, flues, sweating, grading, &c., but the subjects are too large for a letter such as this. Thanking you in anticipation for publication.''

AGRICULTURAL CO-OPERATION IN ENGLAND.

We are indebted to the Secretary of the British ''Agricultural Organisation Society,'' The Broad Way, Westminster, Londan, for the following article entitled ''Agricultural Co-operation in England.'' With the sender, we feel sure that agriculturists in Queensland will be interested in what is taking place in the industry on the other side of the water. While co-operation in agriculture is not new in England, yet its growth during the past twelve months almost entitles it to the description of a new movement—one which is certain to affect profoundly the future of English agriculture.

We commend this article to the earnest consideration of our country readers, many of whom have always been strong advocates of co-operation in agriculture in this State. We are promised short articles from time to time from the same source, and trust that such a movement in the interests of the farming community will find a congenial home in Queensland.

AGRICULTURAL CO-OPERATION IN ENGLAND.

Some account of the striking development of agricultural co-operation in England during the last year will be of interest to the wider circle of agriculturists. Much was heard of the word ''reconstruction'' during the last stages of the war and for the first few months following it, but it is difficult to point to any great achievements in this direction is most departments of national life. It is pleasant to be able to say that agricultural co-operation is an exception. The progress made during the past twelve months has been little short of phenomenal compared with the previous rate of growth.

Prior to the armistice, besides a certain number of co-operative dairy societies, some co-operative slaughter-houses, and a large number of small societies dealing with eggs, poultry, fruit, market gardening, and allotments, there were only six or seven large co-operative farmers' societies for the purchase of raw materials (feeding stuffs, fertilisers, seeds, machinery, &c.), which covered but a fraction of the country. In other districts there were either under-capitalised and struggling societies or no societies at all.

The prospects of English farming after the war have been by no means clear. There has been an unstable market in farmers' requirements, and a feeling of uncertainty as to what will happen when control is removed in the various branches of the industry. The introduction of the minimum wage and of standardised working hours into agriculture has introduced a factor the future effect of which it is impossible to calculate. The prospect of severe competition from imported food is always present in the farmer's mind. In spite of governmental assurances, the farmer is for all these reasons justly apprehensive as to the future of his industry, in some cases even to the extent of fearing a return to the hard times experienced between 1880 and 1900.

The result has been to make him incline his ear favourably to the claims of co-operative trading, which lead to a real economy in production and a more advantageous system of marketing his produce. The fact that most other businesses have, during the war, made themselves strong by amalgamations and combines has helped in this process, for nowhere are there more combines, rings, and cartels than in the agricultural trade.

The position was admirably put in a letter to a leading farming paper recently—"What is and has been," asks the writer, "the position of the isolated independent farmer working his business as a private trader? He buys a machine here, an implement there, a few tons of cake or artificial manure somewhere else, a few quarters of seed and feed corn, or a few bushels of small seeds, and so on, in another place. These have all to be sent separately, and, naturally, expensively. To express the matter in a sentence, he is buying retail and at a retail figure. But when he goes to sell his produce, the boot is on the other foot; he has to sell to the miller, to the merchant, or to the butcher wholesale, so that the individual farmer, working, selling and buying as a private trader is buying in a retail market and selling in a wholesale one. But as one of a body of farmers under co-operation, he has means in his hands of buying as well as selling wholesale."

During the year the Agricultural Organisation Society, the non-trading and non-political central organisation of the agricultural co-operative societies in England and Wales, has held nearly three hundred meetings all over the country to make the farmers' co-operative movement national in its scope. Its principal aim has been to establish in every country one or more large and well capitalised societies for the purchase of the farmers' requirements and the sale of his produce; and in the case of counties where societies already exist, to get them strengthened by increase of capital and unified by amalgamations.

This campaign met with instantaneous success. During the past eighteen months, societies have been formed in the following counties:—Northumberland, Durham, Cumberland, Yorkshire, Lincolnshire, Nottinghamshire, Warwickshire, Herefordshire, Devonshire, Cornwall, Somerset, Dorsetshire, Buckinghamshire, Surrey, and Kent. Some of these societies aim at covering the whole of their respective counties. In other cases, the counties were already partially covered, or in the case of the larger counties more than one society has been found necessary. Besides these new societies, in certain counties, such as Staffordshire, Derbyshire, and Leicestershire, amalgamations have been placed, and elsewhere the older societies have vastly increased their membership and capital.

The leading farmers through England now take great interest in the movement, and the most prominent feature of the campaign has been the readiness of farmers to subscribe sufficient capital (in most cases £20,000 to £50,000) to start their own society on a thoroughly sound basis, and be able to afford the best brains in the agricultural trading world for their management.

In January, 1920, the societies affiliated to the Agricultural Organisation Society included 469 trading societies dealing in farm requirements and produce, and 920 small-holders and allotments societies. Over one-third of the farmers in England and Wales hold shares in these societies, of which the annual turnover exceeds ten million sterling.

All societies are, of course, formed under the Industrial and Provident Societies Acts. Share capital is limited to £200 per member; interest is limited to 5 per cent. or 6 per cent. A co-operative society exists to make savings rather than profits, but any profits that arise after payment of interest, &c., and adequate provision for the reserve fund, are divided on the well known co-operative principle, *i.e.*, in proportion to the business which each member has done with his society.

A further enlightening fact is that the Agricultural Wholesale Society, formed two years ago to act as the co-operative wholesale society and the central trading body for agriculturists, has had a growth commensurate with the growth in the counties. It is equipped not only to buy farm requirements in bulk, whether at home or oversea, for distribution to the individual societies, but also to dispose of their united produce in the great markets of the world. The whole of its shares are owned by the agricultural co-operative societies in the country, and its profits go back to the member societies in proportion to the volume of their trade with it.

SUNFLOWER SILAGE.

"It may be the most important cattle feed discovery of years," is the significant sentence with which a writer in the American "Country Gentleman" introduces an article on experiments made in the State of Montana, U.S.A., with sunflower ensilage as a feed for dairy cattle. Lieutenant-Governor W. W. McDowell, of Montana, who owns the Valley of the Moon ranch, near the town of Missoula, by his own experiments, has found these were average figures for production of an acre in Montana:—Lucerne, 3 to 4 tons; timothy, 2 tons; sunflower, 25 tons.

For years the agricultural department of the Montana State College at Bozeman, Montana. had experimented, and had officially announced that sunflower silage was a splendid feed for cattle—for dairy cattle in particular; that it was good for the cattle; that it made a cow give more milk; and that the tonnage an acre far exceeded anything that could be expected of lucerne or timothy.

Farmers began to think about it. They heard, too, that in the Eastern States corn produced the largest tonnage for silos, and that 10 tons an acre was the best average corn could show in the most favoured States. Here, then, was a sunflower variety whose lowest average was two and a-half times as great, and which had been known to produce as high as 40 tons an acre, growing freely in the Montana climate, and, on paper at least, with everything to recommend it.

The "Country Gentleman" reporter paid a visit to the Valley of the Moon ranch to see for himself. He found 5 acres under sunflower. It was the Russian variety. The plants stood from 6 feet to 8 feet tall, as a general average. Some were 10 feet tall, and here and there were a few that stood 15 feet. From the foreman he learned that it cost five dollars an acre to plough and harrow the ground. The seed for the 5 acres cost four dollars an acre. The ground had been prepared in May, and seeded in June. It was really at least four weeks late. With this handicap the yield on the strip of the Valley of the Moon ranch was up to the average.

The sunflowers grew in rows 30 inches apart, and were about 6 inches apart in the rows. During the growing season the sunflowers were cultivated between the rows just as corn would be. The summer of 1919 was unusually dry in Montana, and a little irrigation was used. Plenty of water causes the sunflowers to grow larger, but it is said that they can be raised on what is commonly known as dry land.

On a larger acreage the cutting would be done with machinery, but Mr. McDowell used a corn knife. The plants are cut as near the ground as possible, because every bit of the stalk is valuable silage. The harvesting operation was very simple. Six men attended to the job. Two cut the plants, two hauled the sunflowers in wagons to the silo, one fed the chopper, and the sixth played a hose on the sunflowers as they passed through the chopper. The 5 acres were cut, harvested, chopped, and deposited in the silo in six days, or 48 hours of actual work.

Lieutenant-Governor McDowell says:—"The best way to use the sunflowers for silage is to cut them green and prepare them at once for the silo. At the same time farmers who did not have a silo have obtained very satisfactory results by cutting them green and shocking them as is done with corn in the Southern and Eastern States. Farmers near Huntley, Montana, tried this last summer and found it worked all right. Cattle seem particularly fond of it, and will leave nearly any other kind of feed to get the sunflower silage."

The silo on the Valley of the Moon ranch has a capacity of 100 tons. It was built during the past summer. It measures 34 feet from ground to roof. It is circular or rather polygonal in shape and 14 feet in diameter on the inside. It is of lumber and has double walls containing a 4-inch air space. This air space acts as a non-conductor of heat, and is supposed to prevent the silage from freezing during the coldest weather. The silo has double doors built from top to bottom, each door about 3 feet by 2½ feet. The doors open to a covered manway built outside of the silo. Iron bars on the outside of the doors furnish a ladder.

The chopper is placed at the base of the silo on the outside. The chopper is operated by 15 horse-power oil engine. The chopper cuts stalks, boughs, and the flowers into particles about half an inch wide. A fan in the chopper blows the chopped sunflowers through a pipe to the top of the silo. Water is necessary during the chopping, otherwise the silage may become musty or mouldy. The chopper cuts at the rate of from three to six tons an hour. This particular outfit cost:—Silo, £120; chopper, £70; engine, £200; making a total of £390. At current Montana prices, the sunflower yielded £80 per acre, compared with £24 for lucerne and £14 for timothy. In face of these facts, Mr. McDowell says:—"If it can be demonstrated to the satisfaction of Montana farmers that a crop of this proportion can be raised on average ground; if the feed values are such as successful experiments have shown to my satisfaction; if the feed is as good for cattle and for milch cows in particular, and if the cattle like it as well as is claimed, then sunflower silage is the most important cattle-feed discovery of a great many years.

"It practically means that a man can winter twice as many cattle by raising sunflowers as he could by raising lucerne, clover, rye, barley, redtop, or any of the ordinary grasses or crops raised for cattle feed in Montana."

Mr. McDowell is practical. He is a farmer and not an agriculturist. Nor is he seeking to force his sunflower views on others. His interest was attracted by the experiments at the Montana State College and then he held his own experiment. Mr. McDowell is convinced that he can better results this year.—"Queenslander."

THE AUSTIN FARM TRACTOR.

Some time ago, Mr. H. Leo Mossman, writing to the "Journal of the Jamaica Agricultural Society," suggested that the time would come when cattle-drawn ploughs would give place to the tractor. In a late issue of the above Journal he asks: "Is that time *now*, or do the cane planters of this country intend to wait for another decade before adopting modern methods? We are faced to-day with a spirit of unrest among labourers of every kind. The skilled men are clamouring for higher wages, while the unskilled are still more persistent in their demands for less hours and higher pay. Unquestionably the high cost of living, and of commodities of every kind, necessitates a material increase on old labour prices, but this might be offset by a more systematic use of implements than is at present in vogue. 'Cultivators' for weeding should take the place of hand-weeding wherever practicable, while tractors should supplant the cattle-drawn ploughs."

No one will deny that mechanical work is cheaper than that performed by hand, whether in the factory or on the land, and this fact is being recognised wherever machinery can be employed.

In connection with the use of tractors, a new British tractor has been introduced into Australia, under the name of "The Austin Tractor," by "The Canada Cycle and Motor Agency (Q.) Ltd.," and a demonstration of its powers was carried out on Friday, 7th May, at Mr. Frank Radcliffe's farm, Rocklea. There was a large attendance of farmers, sugar planters, and others interested in agriculture. The land on which the demonstration took place had not been cultivated for thirty years, and consisted of a hard, heavy loam, having a dense growth of couch grass, which would have taxed the strength of both horses and plough to break up at only a shallow depth. To the machine a four-furrow Sunshine plough was attached. It was the general opinion that a team of ten horses would require frequent spells to break up this land, and consequently very poor results could have been obtained by horse-traction. The machine, driven by one of Mr. Radcliffe's sons, was easily started, and travelled at the rate of about 4 miles per hour, no stoppage occurring even on turning at the headlands, as it turns in a very small circle, leaving very little head or side-lands for future attention. On a low gear the tractor gives a draw-bar pull of 3,000 lb. It was on paraffin oil, and using only 2 gallons of kerosene and a little benzine for starting, with a three-furrow plough has ploughed an acre of heavy loam-land in one hour. The spring front axle combines stability with free action. The horse-power at 1,200 revolutions is 25 h.p. On average land, even with unskilled labour, it will do 5 or 6 acres a day. All working parts are enclosed, and practically impermeable to dust and wet. The test was eminently successful, and left no room for doubting what is claimed for it.

CO-OPERATION IN LAND TILLAGE.

In connection with the above machine, the co-operation of the farmers in any district might be attended with a great saving in the cost of preparing the land and in subsequent operations on the farm. Everyone is not ploughing on the same day, or, perhaps, not during the same week, and it would seem to be a good idea for several farmers to combine in the purchase of some form of tractor, to be used in turn in the various operations connected with the cultivation of the land. Co-operative action is no new thing, and wherever it has been tried, it has had the effect of largely reducing the expense of farmers in several directions.

Since the test of the Austin Tractor, on Mr. Radcliffe's farm at Rocklea, the manager of the Canada Cycle and Motor Agency has received a report of a successful demonstration of the capabilities of the machine on 27th April, on Mr. Thygesen's property, at Wyreema, from its Toowoomba representative, Mr. W. A. Elvery. The report states that this was a more severe test than that given on Mr. Hickson's property on the Drayton road, the soil on the former farm being heavy black, very dry, and hard to work. The plough used was a Saunders three-disc, which had to be weighted to force the discs to cut to the depth required, namely, 9 inches. On this occasion an outrigger was fixed to the side of the plough, and to this was attached a harrow 6 feet in width, thus completing the ploughing and harrowing in one operation. The saving of time in this manner is obvious. The plough turned 36 inches of ground each cut, and as the harrow used was 72 inches wide, it overlapped the ground ploughed by 36 inches, thus harrowing the ploughed ground twice. The field ploughed and harrowed covered 5 acres, and the work was completed in 5¾ hours. The machine could not have run better. During the trial, it was only stopped once to allow the onlookers to get a close view of its mechanism.

An experiment was then made with a mixture of crude oil and kerosene, and the tractor worked just as well with this mixture as on pure kerosene, which should be a good selling point for the tractor. Crude oil is sold at 11d. per gallon and kerosene (Voca) at 18s. per case. One gallon of crude oil and one gallon of Voca kerosene would cost 3s. 2d., and this quantity is sufficient to plough 1 acre. This may be considered cheap enough, 10½ gallons of the mixture being sufficient to plough 5 acres.

GRAIN ELEVATORS.

The question of the necessity for grain elevators appears to have occurred to the farmers in the far North, judging from a letter received lately from Mr. F. L. Wise, Field Assistant of the Department of Agriculture at Tolga, requesting that an article on these erections, published some time ago in this journal, be republished in the interest of the graingrowers of the Cairns district. That article was originally written by Mr. N. A. Cobb, and appeared in the ''Agricultural Gazette'' of New South Wales, and subsequently, by permission, in the ''Queensland Agricultural Journal.'' It is as follows:—

When I see a farmer go to his nearest market town, several miles distant, pay 5d. each for bags by the wagon-load, take them home, and put them away in a dry place until wanted, then once more carry them out to the field, fill them with grain, sew them up, and, if he is a careful man, label each bag separately, lift the bags of wheat on to a high dray, take them to his barn, unload them, stack them, and then later on lift them down again, rip them open, clean the grain by machinery, bag it up again, label the bags again, and stack them once more until such time as the market price suits him; when I see him, having made a sale, unstacking them once more several weeks later, sewing up the holes the mice have gnawed meanwhile, lifting them again on to his high dray, and off again, one by one, at the railway shed; when I see the grain leaking out through bursted, torn, and gnawed bags all the way from the railway-shed to the seaboard; when I see bags of precious grain, representing the income of farmers in all parts of the country, standing days at a time exposed to the wet weather and losing value—simply because grain in bags cannot be handled fast enough to prevent a glut at the metropolitan or other central market; when I see valuable property, such as railway trucks, standing idle day by day, letting interest on the people's money go to waste, because these trucks cannot be loaded with bags of wheat quickly and despatched to their destination; when I see thousands of bushels of uncovered bags of wheat caught in a shower; when I see the wheat after several hundred miles' railway journey, unbagged and put into fresh bags before transhipping, because the original bags are worn out; when I see them again lifted, and lifted, and lifted slowly into the ship's hold; finally, when I lean back with a shudder and try to imagine the high old time the ship's rats and the weevils have among this honeycomb of bags of wheat—a picnic lasting, it may be, several months—until the grain is as last unloaded in London and shot into an elevator—when I see all these things I cannot find words powerful enough to stigmatise this universal use of bags. Because this thing is wrong in principle, and can be remedied.

The secret of the remedy—no, it's no secret; it is fairly written against the sky in scores of the greatest and most prosperous towns in America and Europe. Not the secret, then, but the principle of the remedy is this: *threshed grain can, in a large measure, be handled like water.* It will run, it can be poured, it can be pumped; and if only our farmers, merchants, and railway architects will take pains to consider this simple idea, the result will be a change in our methods of handling grain, beginning in the field and ending at the mill.

What would you think of a man who lifted all the water out of his well in a bucket instead of with a pump? What would you think of a man who lifted all the water out over the edge of a tank instead of letting it run out through the faucet at the bottom? What would you think of a man who habitually carried water downhill instead of letting it run through a spout? What would you think of a man who, having 400 gallons of water to transport, put it into 400 one-gallon receptacles instead of into one 400-gallon tank? What would you think of a man who caught his roof-water in an underground tank, so as to have the pleasure of pumping it up again when he wanted it for use? What would you think of a man who preferred to store his water in a way that not only allowed but actually invited various sorts of vermin to injure it, and cause it to leak away? The English language is hardly strong enough to tell how big a fool such a man would be.

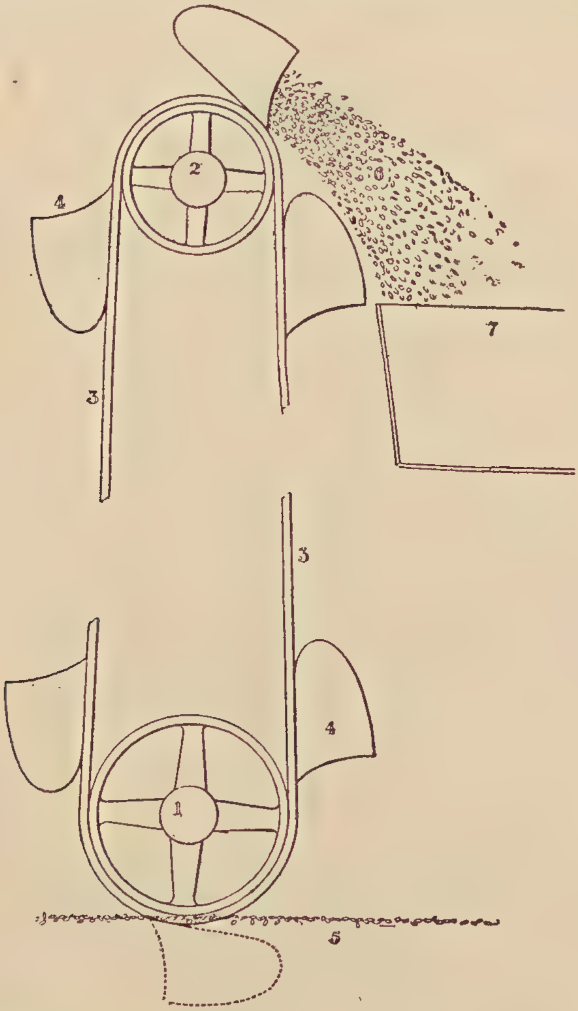

FIG. 1.—Rough diagram to illustrate the action of an elevating belt. The pulleys 1 and 2 carry an endless band, 3, to which are riveted buckets, 4. As the buckets pass round the lower pulley they dip into the grain, 5, and fill themselves. As they pass over the upper pulley they shoot the grain into a trough, 7. The distance from the lower pulley to the upper is over 100 feet in the largest elevators.

Yet, observe how grain is handled in Australia. It is lifted by hand, when to lift it by simple and inexpensive machinery would be both easier and cheaper. It is lifted over the edges of receptacles instead of being allowed to run out of them at the bottom; it is habitually carried downhill instead of being allowed to run of its own accord. When being transported by the thousand bushels, it is cooped up in 4-bushel receptacles. It is everywhere put down so as to be lifted again by hand at the next handling. It is preferred to store it in a way that not only allows but actually invites various vermin to injure it and cause it to leak away.

Why not introduce the elevator system of handling grain, as has been done in America and Europe?

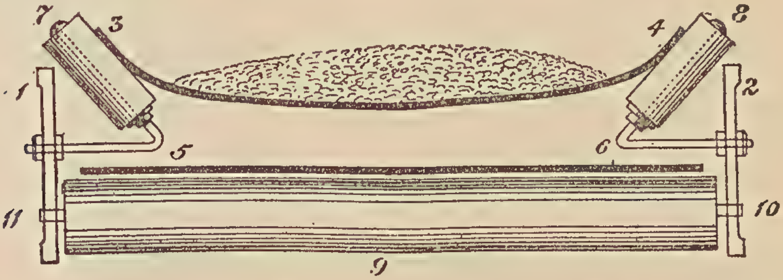

FIG. 2.—Cross-section of a horizontal grain-belt taken near one of the pairs of oblique rollers used to keep the edges of the belt somewhat raised.
1 and 2, sides of the long framework.
3, 4, edges of the belt.
5, 6, returning portion of the belt.
7, 8, oblique rollers for turning up the edge of the belt.
9, rollers for support of 5, 6.
10, 11, bearings of the rollers 9.

The grain elevator, as its name indicates, is a contrivance for raising grain from a given position, generally near the ground, to a higher position, generally a bin or silo, from which it can at any moment be delivered conveniently and quickly by means of proper machinery.

The essential elements of the grain elevator are:—

1. The elevating and transferring machine.
2. The weighing machine.
3. The bins or silos.
4. The cleaning machine.

The elevating machine is built in a great variety of forms, all, however, embodying the same principle, if we overlook the pneumatic elevator, which we may do for the present.

An endless band passes round two pulleys, one of which is placed above the other, and this endless band carries buckets which, on passing round the lower pulley, dip into grain contained in a hopper, and, on passing round the upper pulley, shoot the grain that has been dipped up into a receiving hopper or spout. See diagram in Fig. 1.

The grain thus elevated may be weighed in special machines adapted to receiving spouted grain, and which automatically register the weights. These machines are usually located at the top of the elevator building.

Before or after weighing, usually after, the grain is carried to its destined bin or silo by means of horizontal belts, or inclined spouts, or a combination of both. The belts are made of canvas, leather, rubber, or a composition, and vary in width from 1 foot to 3 feet, and, while usually running horizontally, may have a grade of 1 in 10, and yet work satisfactorily. A spout conducts the grain on to the middle of the moving belt, which latter receives an upward curvature at its edges through the use of pairs of oblique rollers every 15 to 30 feet, according to its width. Such belts are shown in illustrations 3 and 5, and a diagrammatic cross-section is given in Fig. 2.

The grain-belt delivers its grain into hoppers or spouts, either at its turning point or at an intermediate point, by means of a special carriage which zig-zags the belt as shown in Fig. 4.

The terminal elevators now in process of construction in the United States are costing about 30 cents per bushel of capacity. Previous to the recent advance in price of all kinds of material, terminal elevators were built at from 20 cents to 25 cents per bushel. I have seen (and examined in many cases) many hundreds of elevators in all parts of the United States, and among them all have seen but one with iron bins. They must be uncommon. The large terminal elevators are seldom completed in less than twelve months; the smaller ones (100,000 to 200,000 bushels) may be contracted for at half the above time limit. As to particulars of most modern machinery, very much may be said. In general the grain-cars are run into the elevator and unloaded by means of steam-shovels—which are large scoops worked by means of rope tackle and a steam winch, the scoops being dragged empty to the ends of the car by hand, and then hauled back by steam, thus bringing the grain out in the course of a few minutes. The grain falls through an iron grating of about 4-inch mesh, designed to catch coarse materials, and to prevent accident, and then goes down into the hopper, into which the elevator buckets dip (see Fig. 3). The buckets, of which there are a variety of good makes, hold about half-a-bushel, and are attached to an endless band, which passes to the top of the elevator; here the buckets, turning to begin their downward trip, empty themselves into the weighing-bins. These are so constructed as to be under the control of one man, who does the weighing. The bookkeeper has his office near the weigher, and works in conjunction with him. An automatic signal warns the weigher when the weighing-bin is nearly full, and he, by moving a lever, starts the grain to running into a second duplicate weighing-machine, during the filling of which he weighs and records the first, and starts it to emptying itself into its assigned elevator bin. When the duplicate weighing-machine is full, the first is empty, and so these weighing-machines

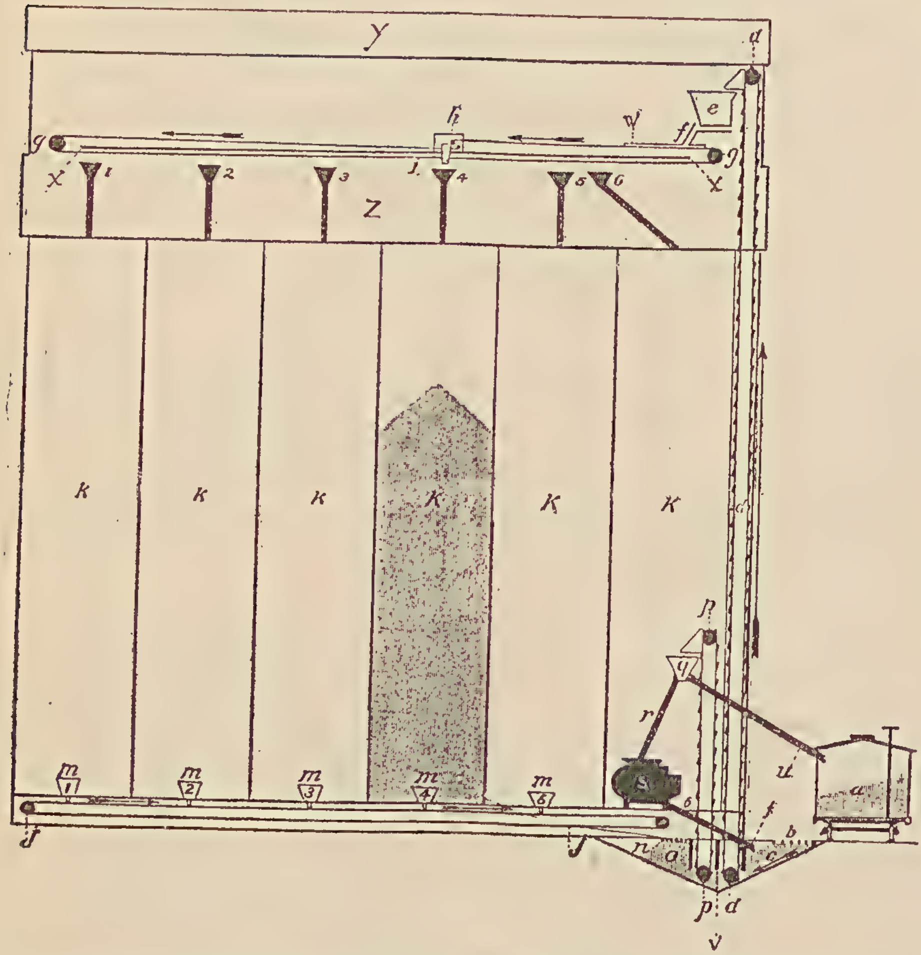

FIG. 3.—Diagram of an elevator. *a*, car with grain; *b*, grating over the hopper, *c*; *c*, hopper; *d d*, pulleys carrying the endless band and elevator buckets; *e*, weighing-bin; *f*, *w*, delivery spout to grain belt; *g*, *g*, grain belt; *h*, zig zag, which is moveable back and forth on the track, *x*, *x*; *i*, spout; *k k k*, bins or silos, to which the spouts, 1, 2, 3, 4, 5, 6, deliver grain; *m m m*, mouths of the bins or silos; *l l*, carrying-belt delivery into the hopper, *o*, through the grating, *n*; *p p*, secondary elevator delivering to hopper, *q*, whence the grain may go to the cleaner, *s*, *viâ r*, or to the car, *viâ u*; *y*, *z*, location of the roofs of the elevator.

work along alternately. In the largest elevators a more elaborate system of the same nature is used. The weighing-machines are made by the principal scale-makers. The weighing-bins and other machinery in the top of a wooden elevator are supported on a different structure (separate) from the bins. The sides of these latter, in large elevators, vary in height several feet, according to their state of dryness, and are not a fit basis for the support of shafting, &c. This great expansion and contraction of the walls of the bins is a peculiarity of wooden elevators; brick and steel bins are more stable.

The grain is spouted from the weighing-machines to any desired bin by means of belts and various ingenious spouts, the best spout I have seen being the design of E. D. Mayo, of Minneapolis. This is an elbowed revolving iron spout, with a high degree of adjustability. A circular steel track 12 feet in diameter is hung from the ceiling under the weighing-bin, concentrically with the mouth of the bin. A light and simple steel carriage running on this circular track supports the lower end of the iron spout, which runs out at an angle of 45 degrees from the mouth of the weighing-bin. This spout, therefore, revolves in a circle, and can be pointed in any direction; and attached to its lower end is a second long iron spout, with adjustable joints. The lower end of this latter rests on the floor containing the trapdoors leading to the various bins, and this lower end being on castors the spout can be easily dragged by hand and placed over any trapdoor within a radius of 15 or 20 feet.

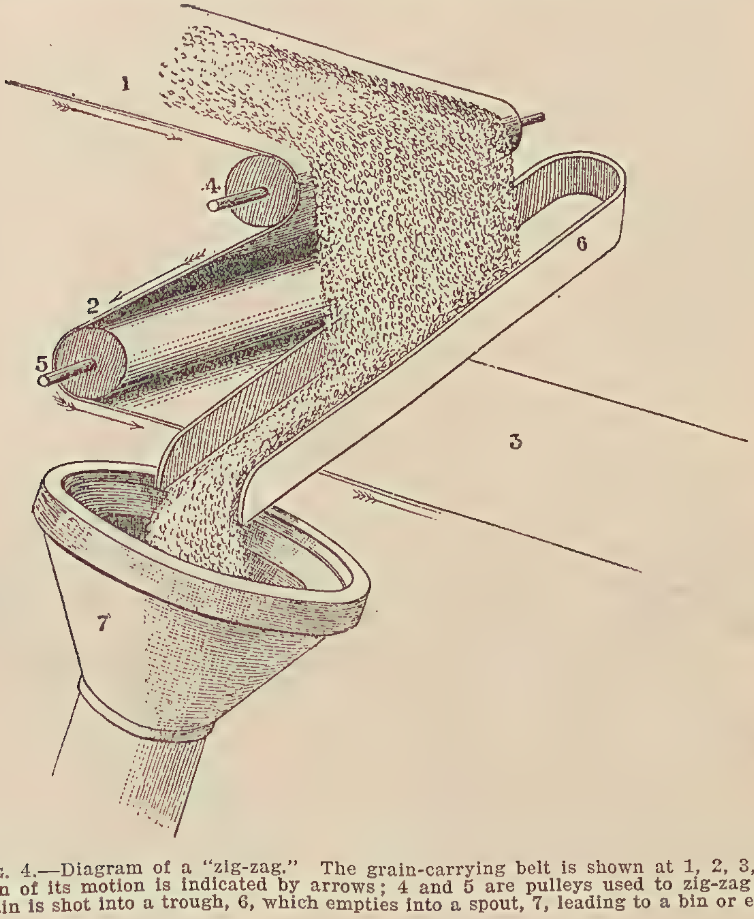

FIG. 4.—Diagram of a "zig-zag." The grain-carrying belt is shown at 1, 2, 3, and the direction of its motion is indicated by arrows; 4 and 5 are pulleys used to zig-zag the belt. The grain is shot into a trough, 6, which empties into a spout, 7, leading to a bin or elsewhere.

The grain is generally cleaned and graded on one of the lower floors of the elevator by means of machines having a capacity of 1,000 to 2,000 bushels per hour; prominent among which I may mention the "Monitor" Wheat-cleaner, made at Silver Creek, N.Y. Wherever, in a large elevator, the grain is carried in a horizontal direction it is emptied on to a belt—flat, and about 3 feet wide —which runs horizontally, and is animated by means of pulleys run by an endless cable. This cable system runs in all directions throughout the elevator, and sometimes for a good fraction of a mile outside. Wherever it goes, its main object is to animate a series of wide, grain-carrying, horizontal belts. Sometimes, by means of an elevated outdoor system of this kind, grain is carried several hundred yards over the tops of buildings and warehouses to the ship's docks.

Whenever it becomes necessary to transfer the grain from a belt to a spout (as at a ship's side), a device is introduced by means of which the belt is zig-zagged and the grain is caught in a hopper and so spouted. Fig. 4 is a diagram showing the nature of one of these zig-zags. The zig-zags are a permanent feature of all large belts from which grain is spouted; and the best of them are on ways, and adjustable along the belt by means of hand-cranks.

The bins of wooden elevators are made of timber, 2 inches by 4 inches to 2 inches by 8 inches, spiked flatwise. The large terminal elevators, having bins often upwards of 75 feet deep, require 8-inch timber for the lower parts of the bins where the thrust is greatest; and this, among other reasons, adds to the relative cost of such elevators when compared with those of smaller size. The number of bins per elevator varies widely, according to the class of business, sometimes reaching 200 or 300. Large elevators often have bins of 50,000 bushels' capacity and upwards. These hold grains of various grades, various kinds, various seasons, various owners, &c., &c.

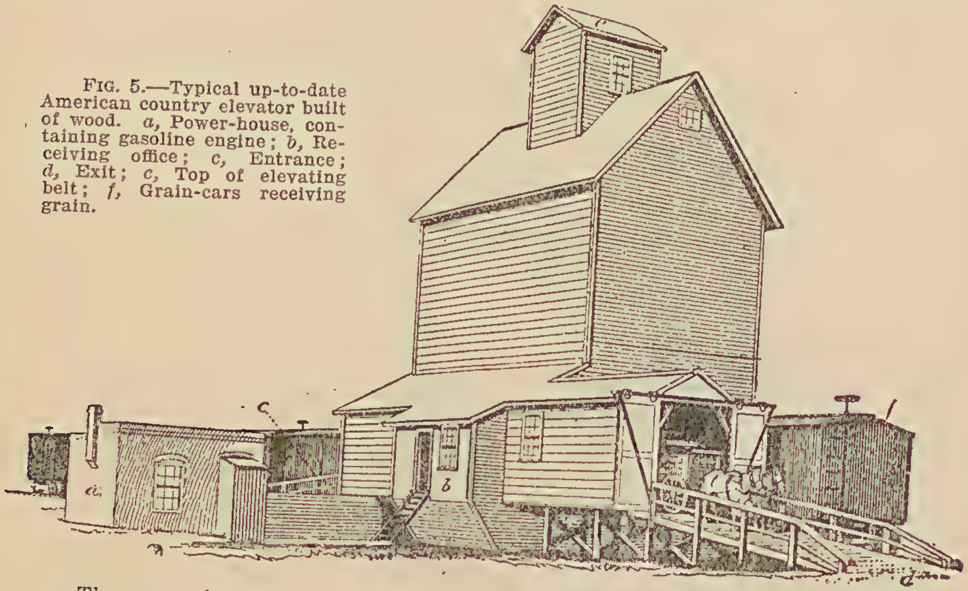

FIG. 5.—Typical up-to-date American country elevator built of wood. *a*, Power-house, containing gasoline engine; *b*, Receiving office; *c*, Entrance; *d*, Exit; *c*, Top of elevating belt; *f*, Grain-cars receiving grain.

These are, in general terms, the features of the most recently-built terminal elevators in the United States. The exterior appearance of some of these elevators is very well shown in the accompanying photographs, which I have taken, as opportunity afforded, in my various visits to the great wheat-handling centres of the world. Of such elevators there are some 200 in the United States, located principally at Chicago, Minneapolis, Duluth, and Buffalo. A one-million bushel elevator requires engines giving 125 to 200 horse-power, according to circumstances.

The country elevators, such as are used in the principal wheat areas of the United States, have a capacity of 20,000 to 40,000 bushels, and are constructed at from 15 cents to 20 cents per bushel, according to size—20 cents for the smaller size and 15 cents for the larger size. These are now often fitted with gasoline motors instead of steam. These elevators, as a rule, do not admit cars. Those of older construction do not even admit teams. An outside platform (often roofed over) receives the grain-wagon upon a platform scales, and the load and the wagon are weighed. Without moving, a slide in the side of the wagon is pulled, and the grain runs from the wagon into the receiving hopper. When the wagon is empty it is weighed, and this weight subtracted from the first weighing equals the delivery. In the more newly-constructed country elevators provision is made for driving grain-teams through the elevator. The illustration on page 143 shows admirably the general form of an up-to-date American country elevator.

The elevating and cleaning machinery are the same as for the larger elevators already described, only on a smaller scale. According to my observations, there are between 15,000 and 20,000 of these elevators in the United States, some single States containing nearly 2,000. These elevators are owned by various elevator companies, which compete with each other in the liveliest fashion. The country elevators are the main feature of the American elevator system. They handle all the wheat raised east of the Rocky Mountains, and some of that raised on the Pacific Slope, while the terminal elevators of large size handle only the grain that is exported. Very much more capital is invested in these country elevators than in the large terminal elevators. I have seen scores of small towns having three or four of these small country elevators each—in fact, this is about the average number per railway depôt in North Dakota and North Minnesota. Plenty of country towns contain six or seven, and I am informed that the little town of Eureka, South Dakota, possesses no less than thirteen. Of course, each elevator under such circumstances represents a different owner, except where, as is not seldom the case in larger country towns, one company has two or more elevators in the same town.

FACTORS IN SUCCESSFUL TRACTOR WORKING.

In view of the great interest taken by the farming community of Queensland, more especially in the sugar districts, in the advent of the tractor for ploughing, harrowing, and furrowing, we think it well to invite their attention to the following article which appeared in the ''Agricultural Gazette'' (London) for 26th March last, having reference to the successful working of a tractor, and, what is of great importance, to the training of a driver, and to the method of dealing with the wages question. The writer, D. N. Hardy, sets forth very clearly a method of apportioning the pay of a driver, when the tractor is at work, to the value of his services when the machine is idle:—

''Primarily, the successful working of a tractor, like anything else, depends upon the owner himself. His managerial ability will generally be indicated by the results obtained in all the branches of his farm, and anyone who gets first-class results in other departments ought to get the best out of a tractor, too.

''The first point the owner must consider is to have a really good driver, as the operator has really the biggest influence on the year's balance-sheet. In many cases, especially on smaller farms, the owner is himself the driver, and it is noticeable that in a great many cases the owner-driver gets by far the best results from his outfit. The reasons for this are, of course, perfectly obvious. However, there are various objections to the owner driving his tractor himself. For one thing, it is often very inconvenient for him to be tied to one particular job, while unless he has a good bailiff or a partner to keep an eye on the labour, he will get very little work done on other parts of the farm; for all the time his engine can be heard running, his men know the master is not coming their way.

''In many cases the owner's son makes a very successful driver if he has mechanical aptitude, since he also has a personal interest in the tractor.

''If a hired driver has to be engaged, great care should be taken to select the right man for the job; and it is to be regretted that the shortage of skilled drivers at the present time often impels owners to employ most inefficient drivers, entailing constant breakdowns and heavy repair bills. In this connection it may be remarked that a few training centres where future drivers could be taught driving and repair work, on really sound, practical lines, would be a great boon to tractor users. Such a centre should be staffed by men with a thorough practical knowledge of all conditions under which tractor work is carried on; and, furthermore, the instruction should include the actual handling of tractors in the field, minor repairs and adjustments, setting of implements, &c., and not of mere blackboard talks.

''A natural aptitude for mechanics is essential if a man is ever to make a good driver; and by the establishment of such centres those unsuitable for the work could be picked out in a very short time, and be advised to give up. Such schools might conveniently be run in conjunction with some of our agricultural colleges and farm institutes. It would also be in the interests of manufacturers to give thorough courses of instruction in driving their own types of machine.

''Of course, the ideal way to learn driving is to get placed as a second hand on a tractor in actual use; but the difficulty is to find anyone willing to take the risks of training a novice on a machine which is depended on to carry out the work of a farm.

''If a driver is to be specially trained for a tractor it will generally be found that one of the mechanic type, from a country town, will be likely to prove successful; since amongst other things he combines the quickness of intellect of the town worker with some knowledge of farm conditions. In any case, it should be obvious enough that no one should be put on the job who is prejudiced against mechanical traction.

''In order to secure a good driver it is necessary to pay a wage a good deal above the minimum. To attempt to do otherwise is absolutely false economy, and the extra amount should be considered as a form of insurance. By paying for a good driver at higher rates one minimises the risk of damage to several hundred pounds' worth of machinery, and diminishes the rate at which it depreciates. Moreover, when a man is ploughing, say, four acres a day, he can obviously be paid a good deal more than one who is ploughing one acre with horses, without bringing the cost of labour per acre very high. Furthermore, a man who can keep his tractor in running order, and available at any moment it happens to be wanted, is certainly worth a good deal more than one whose machine is standing idle on many days when it could otherwise be working.

''With regard to the extra wages suggested for the tractor driver, it may be contended that these cannot be paid in respect of days when the tractor is idle and the man is engaged on ordinary farm work. To meet this point, the system of payment employed by the Food Production Department during the war may be worth the consideration of tractor owners. By this system the driver would be paid the minimum wage regularly, together with a bonus upon each acre worked, calculated upon agreed rates. By this combination of piecework and time-paid rates the driver is paid a higher wage than the other men; but the amount is automatically reduced when the tractor is idle. Various modifications in the system may be introduced in order to insure a reasonable amount being paid at all times.

''Assuming that the important question of obtaining a good driver is satisfactorily settled, another point of great importance is the type of tractor used, and its suitability for the farm it is employed on. Every class of tractor has some special features that make it suitable for certain types of farm and certain kinds of work; hence the farmer should see that he gets the right class of machine for the work he wants done. Without discussing all the types of tractor and their special uses, it may be said that for the average farmer the light to medium weight tractor is the most suitable general-purpose type, as showing the greatest adaptability to general farm work and to various types of farm. These tractors are also easier to handle in small and badly-shaped fields. If the farm or particular kind of work calls for special features in the tractor a specialised type to meet these requirements should be obtained. In order to gain some particular advantage it may be necessary to sacrifice some other advantages; but this is unavoidable, and here it is that the judgment of the buyer plays an important part.

''While a good deal depends upon the type of tractor used, far more depends on getting the proper type of implement to be used with it. When purchasing implements, the buyer should bear in mind the power and weight of his tractor. Makers often claim that their machines will pull larger implements than is really the case; but if the tractor is overstrained in this way the result will be less work done, constant breakdowns, and rapid deterioration of the tractor. As regards this point, it may be well to obtain the opinion of someone who has had experience with the make in question. In any case it may be taken as a general rule that none of the machines which fall into the category of light tractors are capable of pulling more than a two-furrow plough or its equivalent, on average land. The type of implement used will be dictated by the needs and opinions of the owner.

''In addition to implements, there is a certain amount of equipment which should be provided for the tractor, and which make for ease and economy of working. A lock-up trailer box, large enough to contain several days' supply of fuel and lubricating oil, together with tools, &c., will enable the driver to take his fuel with him, and obviate the necessity of sending it out by a horse and cart, which at once puts another item on to the cost of ploughing, &c. In districts where water has to be taken out from the farm the trailer box may be built on to a water tank with wheels, which can be towed behind the tractor, thus further saving extra labour.

''Attention to the provision of suitable tools and spare parts, including plugs, is well repaid. Amongst these may be mentioned a plug spanner which fits the plugs used. This will be found to save many broken porcelains.

''The general care and maintenance of the tractor, upon which depend its life and its availability at all times, contain many points which will be attended to by the expert driver, but ignored by the careless one. Such a driver is worth good wages, for he alone can reduce depreciation to the smallest possible figure. A bad driver, on the other hand, is dear at any price, for no tractor can be a paying proposition if it is ruined in one year. In any case a periodic overhaul should be carried out by a reliable mechanic.

"As regards actual costs, it is obvious that to a certain extent the more days per year the tractor works the less the cost. In this connection it is often assumed that a tractor is an economic proposition on a large arable farm only. However, as a tractor can usually be hired out very easily for contract work, it should still prove a good investment for the smaller farmer, especially if he has a driver who can carry out his own running repairs."

COTTON-GROWING IN QUEENSLAND.

Last month Mr. V. A. Wawn, the proprietor of "Wawn's Wonder Wool," in Sydney, paid a visit to Brisbane with the object of making inquiries into the possibilities of growing cotton in Queensland. Much of last year's production was purchased by him, and his only regret was that there was not a larger supply available. In interviews with representatives of the metropolitan journals, he stated that he had seen excellent samples of cotton grown in this State—samples that were second in quality only to those produced in Egypt. The cotton purchased by him from the Queensland Government was at the present moment being manufactured into cottonwool by special carding machinery, which he had installed in his manufactory in Sydney, and with this, he said, he would be able to increase by four or five times the present output of the finished article. This cottonwool was the first ever manufactured in Australia. The whole of the raw cotton to meet Australia's needs could be grown in the Commonwealth, and every encouragement should be given to assist the cotton-growing industry.

Mr. Wawn paid a visit to Mr. Murray's plantation at Redbank Plains, Goodna, where he obtained an excellent sample of cotton. Despite the unfavourable season, the cotton showed a splendid return. Mr. Murray told him that it was a mistake to grow cotton on larger areas than from 5 to 10 acres until the difficulties in regard to picking had been thoroughly overcome.

Our visitor said:—"At present I am utilising 25 tons of cotton every year for making cottonwool, and in the near future I expect to be utilising a ton a week. But owing to the high price of cotton to-day I want to stop exporting it. The price of imported cottonwool, for instance, has risen from 6d. lb. to 3s. 3d. during the past few years, and yet last year what cotton I was able to purchase cost me but 1s. lb. Certainly it needs treating before it can be manufactured into cottonwool, but I am anxious to treat the Queensland raw cotton and not import it. In the past I have imported my carding machines from Lancashire, but these will shortly be made for me in Australia. I trust that Queensland will see the practicability of taking up the growing of cotton in earnest. There is undoubtedly a great future for the crop when it comes. A thousand tons of cotton approximately are imported into Australia every year. I will eventually use my machinery for the manufacture of 'Wonder Wool' in the very spot where the cotton is grown, and, so far as I can see, that will be Queensland. If the small farmer will only get a move on he will not regret it.

"From a defence point of view Australia would benefit. She is bound one day to go in for munition making, and when she does she will need cotton. Every shell the 'Queen Elizabeth' fired over the heads of our boys at Anzac contained a cwt. of cotton. Further, there is no reason why we should not grow the cotton and spin it into gauzes, lints, string, cotton reels, and clothes."

Regarding Mr. Murray's opinion on the size of cotton plantations, we are quite of his opinion. We who remember the earliest days of cotton-growing, when the Lancashire Cotton Company commenced operations on a large scale, can substantiate his statement that cotton-growing, on a large scale, will not prove successful until a reliable mechanical cotton-picker has been introduced. In the days when farmers took up the business as an adjunct to other crops, and, at the most, planted 10 acres, cotton-growing paid them well, as a small area did not demand an army of pickers. An average cotton crop may be put at 1,000 lb. of seed cotton per acre, but over 2,000 lb. have been obtained per acre in a good season in Queensland. Last season the price realised by growers was 5½d. per lb. We ask: Will it not pay to grow cotton in small areas in conjunction with other crops? Which of the two crops—cotton and corn—costs most for harvesting and preparation for market. Corn must be pulled, husked, shelled, and winnowed; cotton has only to be picked, and it is ready for the market. Advocates of cotton-growing are invariably met with the objection that picking will cost too much. Are not the operations of picking, &c., in the case of corn, open to the same and stronger objection? Does not the work of hilling up, digging, picking up, and bagging entail expenses in excess of that attaching to cotton-growing and harvesting? There is no crop which entails less labour from seed-time to harvest than cotton.

HARVESTING, PICKING, THRASHING, AND STORING PEANUTS.

Most of the peanuts grown in Queensland are in districts where the industry is comparatively new. It may therefore be advantageous to growers to read the following directions for harvesting, picking, and handling peanuts, which directions have proved successful and are in use in the United States of America by the best and most progressive growers.

The following article on the subject was published by the United States Department of Agriculture (Circular 81):—

HARVESTING.

As no definite rule can be given by which to determine when peanuts are ready to dig, each grower must depend largely upon his own judgment. In the lower South, where frosts do not occur until quite late, the vines assume a yellowish colour when the peanuts are mature. Peanuts should be dug when the vines have the greatest number of mature pods. Beginners in peanut growing should be careful not to dig too soon, as immature nuts shrivel and are light in weight when cured. A few early-formed peas are likely to sprout before digging time, especially if there is a period of rainy weather about the time the peanuts are maturing, but usually the loss by sprouting is not sufficient to justify premature harvesting.

Peanuts ordinarily are ploughed from the ground with a turnplough which has the mouldboard removed, as shown in figure 1, to prevent throwing dirt over the vines. This plough should be regulated by means of a wheel attached to the beam so that the peanut roots can be cut off at any desired depth. The machine potato digger, shown in figure 1, does very satisfactory work and will dig 8 to 10 acres a day. This machine removes the peanuts from the ground and also shakes off the soil, leaving the vines lying upon the surface. As the machine digger is rather expensive its use is practicable only where a considerable acreage of peanuts is to be dug. The digging point of the machine can be set to cut off the root at any depth desired.

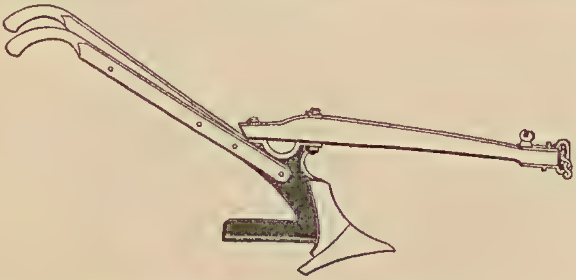

FIG. 1.—Plough Type of Peanut Digger

After the peanuts are dug, a gang of workmen shake the vines free from the soil and throw them in small bunches. Where the machine digger is used, this shaking is unnecessary, as the machine frees the peanuts from the soil. The vines are left spread on the ground or in small bunches for three or four hours and are then placed in small stacks around a pole to cure. If peanuts are allowed to lie exposed for a considerable time after digging, the pods become discoloured and lose in weight and the leaves drop off in handling.

The poles for the peanut stacks should be 3 or 4 inches in diameter and 7 to 8 feet long. These poles or stakes are set into the ground 12 to 18 inches and are well tamped to make them firm. In setting the poles a crowbar or a pointed bar of iron is necessary to make the hole.

Before starting the stack two pieces of lath, scrap lumber, or sapling cut from the woods, about 18 inches in length, are nailed at right angles to the stake 8 inches from the ground, as shown in figure 2, in order to prevent the peanuts coming in direct contact with the soil. In starting to build the stack a few vines are laid across these pieces and the stack is then built up by successive layers of vines, the pods being kept well to the centre against the stake and the tops to the outside. The stems should have sufficient outward slope to shed water. (See fig. 3.) Occasionally a few vines should be hung around the stake in order to tie the stack together. By this method the pods will be near the centre and around the stake, where there is an upward circulation of air and general protection. When the stack has reached the desired height, a bunch of vines is rolled together and pressed down over the point of the stake to form a top, or a little dry grass or a few weeds may be used for this purpose.

It is not advisable to use anything for topping out the small stacks that will prevent the circulation of air. A heavy cover or a covering of green or wet hay will invariably cause the peanuts to spoil.

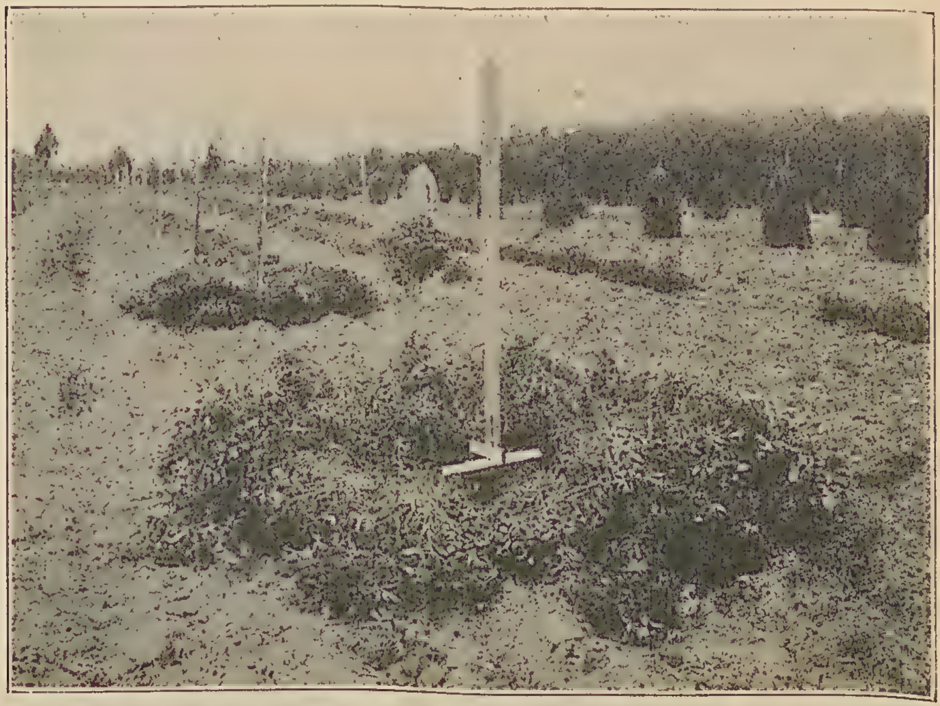

FIG. 2.—Stakes around which Peanut Vines are to be Built.

Curing in barns is not advisable either when curing peanuts for market or where the entire plant is fed to stock, as the crop will cure better in small stacks than when stored in bulk. After the nuts have been cured in the stack from four to six weeks, those intended for feeding purposes may be stored in barns or sheds.

Where stakes are difficult to secure and labour is scarce peanut growers sometimes rake the peanuts into windrows with a hayrake and stack them like hay. In doing this they should cure a little longer before stacking than when they are to be put in small stacks around stakes. If the weather is dry during the curing and stacking and hogs can be turned into the field to save the peanuts left, there is very little loss by this method. Should the peanuts become wet while in the windrows they are seriously damaged for commercial purposes, but the damage is not so great if they are to be fed to stock. This plan should be followed only when it is not practicable to stack them around stakes as described.

PICKING AND THRASHING PEANUTS.

Peanuts should cure in the stack at least three or four weeks before picking or thrashing, in order to allow the pods to become dry and the peas firm.

Peanuts are still picked by hand in some sections, especially when the grower has only a few acres. Hand picking is a very laborious and dirty task. The expense of picking by hand is greater than by machinery, and as it is difficult to get enough labour for handwork machines are used by practically all large growers.

Two types of machines are used for picking peanuts from the vines. The common grain thrasher with a special cylinder for peanuts gives quite satisfactory results in removing Spanish peanuts from the vine. The principal objection to cylinder machines is the tendency to break the pods, but by running the cylinder about 400 revolutions per minute and by feeding properly the breakage can be reduced to a very small percentage. If the peanuts are to be shelled soon after they go on the market, the breaking of the pods is not very objectionable. When oats or wheat are grown in localities where peanuts are raised, a cylinder machine can be used for all of those crops by having two cylinders, one for grain and one for peanuts.

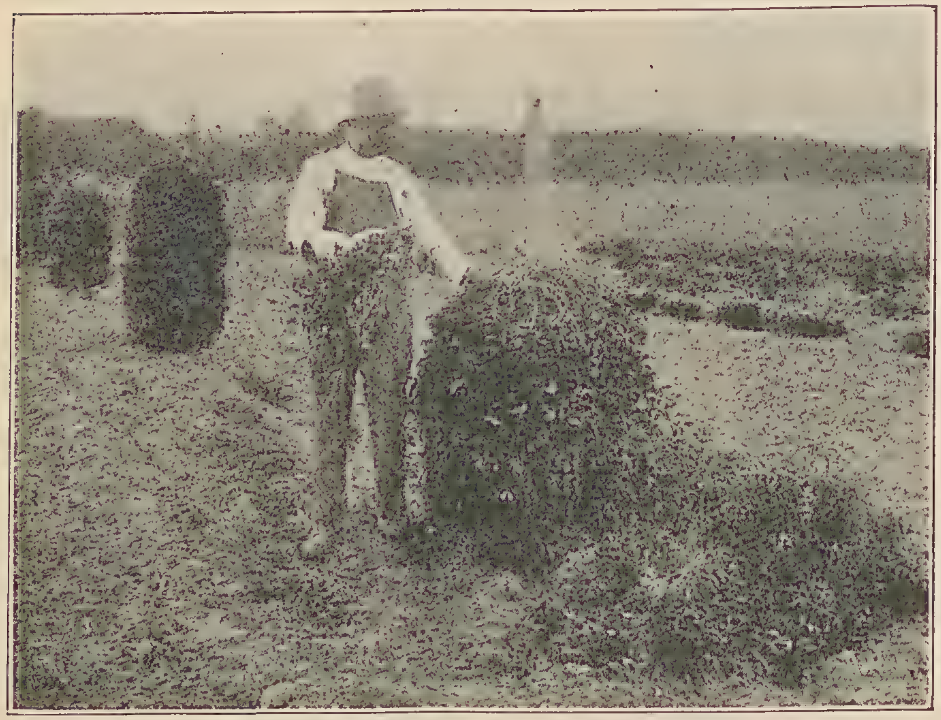

FIG. 3.—A Labourer Building a Stack of Peanut Vines, showing the method used. Completed Stacks are shown in the background.

The peanut picker works upon an entirely different principle from the cylinder machines. The picking is done by dragging the vines over a horizontal frame covered with wire mesh. The nuts drop through the wire and at the same time rubber brushes attached to an endless chain act on the lower side of the screen to remove the nuts. In addition to removing the pods from the vines, these machines have cleaning and stemming devices which remove the dirt and the small stems from the pods. The picker type of machine does not break or injure the pods, and for this reason it is especially desirable for picking peanuts that are to be sold in the pod or stored through the summer months.

After the peanuts are picked they should be stored in a dry place, preferably in a mouse-proof building. If the peanuts are damp after their removal from the vines they should be spread on a floor or stored in a well-ventilated building. When the pods are dry they may be put into bags as they come from the machine.

STORING PEANUTS ON THE FARM.

The farmer's safeguard in the matter of prices obtained for peanuts lies largely in his ability to hold at least a portion of his crop through the winter. Farmers should be prepared to hold their crop for a time rather than place it upon the market during the autumn, when the prices are generally lowest. In order to do this, suitable storage facilities are necessary.

Frequently the bags of peanuts are simply piled in an open shed or in a barn, where they are not properly protected. Occasionally the bags are stacked upon the ground in the field without even the protection of a canvas cover. Neither of the methods mentioned should be followed, because the peanuts would be injured by moisture and subject to the ravages of rats, mice, and other rodents. A building suitable for storing peanuts need not be expensive, but should protect them against injury by moisture and rodents and provide sufficient ventilation. A building constructed of rough timber, with an iron roof, is satisfactory for storing peanuts, provided it is built up from the ground and all openings for ventilation are screened to keep out mice and rats.

In most cases peanuts are stored in bags, because this is the most convenient method. The bags should not be piled more than seven courses high and alleyways should be left every third or fourth row. Some growers follow the practice of storing in cribs or bins, where the peanuts are piled loose until they are wanted for market, at which time they are bagged. The method of storage on the farm matters little, provided the conditions are suitable. The less peanuts are handled the better, on account of breakage.

MARKET GARDENING.

HERBS AND THEIR CULTIVATION.

For some time we have placed before our readers various articles on Herb-growing as a very payable adjunct to general farming. Those who have taken up the cultivation of such herbs as thyme, sage, and marjoram have not regretted doing so, as they have not only sold their season's crop to a good profit, but have been able to dispose of the next crop in advance.

The following article by ''Coolibar'' appeared lately in the ''Queenslander,'' and is well worthy of serious consideration:—

'' At last Queensland is awakening to the fact that the production of culinary herbs is of sufficient importance to induce the man on the land to tackle their cultivation. There always is on the part of any new departure from the old groove a certain amount of suspicion as to whether the venture will pan out all right, and it is well that such is the case, for otherwise every man would be up to his neck in the work of production, with the result that a glut would ensue. Therefore, although herb-growing presents a profitable aspect, it has its limitation as regards production. It is no use taking on herb-growing as a mere hobby; it must be taken seriously, for it is not all fun. In the first place, suitable soil must be chosen in order to ensure success. Even with suitable soil it requires special manipulation in order to get the best results. Deep working is essential, and liberal but not lavish manuring; uniformity of moisture, with free drainage, avoiding a sodden condition, or stagnant wet. A heavy friable loam is favoured for sage. A loam with 35 per cent. sand favours marjoram; while thyme will flourish in 70 per cent. of sand, provided the requisite amount of moisture is present; but very little manure is required, and manure of a vegetable nature is to be preferred to animal manure. If circumstances preclude the application of vegetable manures, as leaf mould or other decomposed vegetation, then thoroughly rotted animal manure may be substituted in sparing quantity. Ground for herbs should be loose below and packed on the surface. This may be brought about by means of rolling or treading immediately after ploughing or digging. In planting the plants should have the soil well firmed round the collars.

Sage should be planted in rows, the rows to be 30 inches apart, and 12 or more inches from plant to plant in the row. Marjoram the same as for sage between the rows, but the plants may be placed closer in the row. Thyme may have the rows placed 24 inches apart, and the plants in the row 10 to 12 inches apart. In every case firm planting is recommended. In the matter of harvesting, curing, packing, &c., Queenslanders have something to learn; and, as we forge ahead in the work, we are likely to stumble across lots of ways whereby we can improve upon the European methods of handling these crops. Some of the samples I have seen of the imported article leave plenty of room for improvement in the general get-up of the article. I have seen importations landed in a condition that was far from satisfactory—mildewed, half-rotten—resembling ensilage, fusty, and lacking flavour, for all the world like mouldy lucerne chaff. One could only conclude that it had been imperfectly cured before shipping. Rapid drying is one of the essentials in herb-curing in order to imprison the flavour and fragrance.

"Artificial drying has been tried, but found wanting. All herbs should be dried in absolute shade from direct sunlight; hence our dry atmospheric conditions lend themselves most favourably to the drying or curing of herbs. Most of the imported samples present the appearance of having been chopped fine by passing through a chaff-cutter close set, as the samples contained all the woody portions of the shoots. A first-class sample of cured herbs should, however, contain leaves only, all woody parts being rejected. Sage is harvested in a slightly different way to that of marjoram and thyme. This plant will not stand cutting hard back; hence the top branches, which carry the bulk of the young shoots, are shorn off with a sickle, knife, or shears by handfuls, and the leaves and young shoots are picked by hand off the portion of the plant left standing. Marjoram and thyme may be cut to the ground by a sickle or other implement. Herbs as soon as severed from the plants should be conveyed to the drying-shed and spread out on trays, benches, or floor. A well-appointed drying-shed should be lofty, side ventilation all round, and a series of drying trays suspended one above the other from roof to floor. The trays may be made of the smaller meshed wire-netting stretched on pine battens, the dimensions to be regulated according to desire. The shed should be divided into three sections, each fitted with trays to avoid mixing. In filling the trays care should be taken not to overload them, for if this is done, or even irregular loading is indulged in, uniform drying cannot be expected, besides which resultant sweating of the heavier masses will cause discoloration, which detracts from the appearance of the finished article and prejudices its market value. When the contents of the trays are thoroughly dried they are unloaded on a clean floor or sheeting, and thrashed with a flail or well trodden with feet. When the leaves are separated from the stems the majority of the woody matter may be separated by means of a steel fork, such as is used for separating gravel and sand; the remainder may be passed over a screen and finished by means of sieving. In handling herbs you will quickly find out lots short of cuts in separating the leaves from the sticks. In the final dressing do not throw away the dust, as this is composed almost entirely of crushed leaves.

"The herb most in demand is marjoram, and it happens to be the easiest to grow harvest, and thresh. The price in Brisbane at present for bulk parcels (anything from 1 cwt. to tons) ranges from 1s. to 1s. 5d. per lb., according to quality. Hand-picked sage will fetch from 1s. to 2s. per lb.; while thyme is about on a par with marjoram. All three are easily grown by means of seed, but when once the plants are established propagation by means of divisions and cuttings can be prosecuted *ad. lib.* Prior to the outbreak of the European war the importation of herbs into the Commonwealth of Australia exceeded £10,000 in value annually. It is up to us Australians to earn this amount ourselves, instead of paying it to Germany, France, Italy, and several of the Balkan States in Southern Europe. Herb-growing is a nice, snug little crop to handle on a limited area of land, and when harvested and packed for the market a £5 parcel can be tucked into the buggy and trundled off to the nearest railway station, and be sent as a booked parcel to its destination. Just compare this with £5 worth of hay, chaff, potatoes, pumpkins, wheat, maize, and other general farm produce. No heavy drays or waggons needed in the herb business. Neither is the manual labour heavy. It is work that the women folks might take an active part in and feel all the better for it. The season for planting is from now right up to August or September, while the time of harvesting will vary according to locality. The crop is ready for the sickle when the plants come into flower.

"To make a start, sow the seeds in a sandy compost in prepared beds or, better still, in shallow boxes; by shallow boxes are meant boxes, say, 4 inches deep and any width or length. The containers of galvanised roofing iron are just first rate for the purpose; the wooden floor underneath the plants enables them to be lifted for transplanting without any serious root-mutilation. Any further information that you may not be quite clear upon will be cheerfully given by 'Coolibar.'"

Pastoral.

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—BEEF AND DAIRY CATTLE.

The Office of the Secretary of the undermentioned Herd Book Societies is 303 Queen street, Brisbane:—

The Australian Hereford Herd Book;
The Shorthorn Herd Book of Queensland;
The Jersey Herd Book of Queensland;
The Illawarra Herd Book of Queensland;
The Ayrshire Herd Book of Queensland;
The Milking Shorthorn Herd Book of Queensland;
The Holstein-Friesian Herd Book of Australia.

Note.—Animals registered in the Commonwealth Standard Herd Book are not necessarily eligible for entry in the Jersey Herd Book of Queensland.

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
	DAIRY BREEDS.			
	AYRSHIRES.			
W. C. Smith	The Haven, Goomeri	1	7	Ayrshire Society of Queensland
L. H. Paten	"Jeyendel," Calvert, S. & W. Line	8	21	Ayrshire Herd Book of Queensland
J. H. Paten	Gwandalan, Yandina	6	21	Do.
Queensland Agricultural College	Gatton	4	40	Do.
State Farm	Warren	3	83	Do.
J. W. Paten	Ayrshire Park, Wanora, Ipswich	10	42	Do.
J. H. Fairfax	Marinya, Cambooya	9	55	Do.
J. Holmes	"Longlands," Pittsworth	6	20	Do.
H. M. Hart	Glen Heath, Yalangur	7	21	Do.
F. A. Stimpson	Ayrshire Stud, Fairfield, South Brisbane	7	77	Do.
M. L. Cochrane	Paringa Farm, near Cairns	5	21	Do.
John Anderson	"Fairview," Southbrook	7	34	Do.
	JERSEYS.			
T. Mullen	"Norwood," Chelmer	3	20	Jersey Herd Book of Queensland
Queensland Agricultural College	Gatton	2	31	Do.
M. W. Doyle	"Oaklands," Moggill	4	12	Do.
G. A. Buss	Bundaberg	1	15	Do.
R. Conochie	Brooklands, Tingoora	9	21	Do.
W. J. Barnes	Millstream Jersey Herd, Cedar Grove	10	37	Do.
W. J. Affleck	Grasmere, N. Pine	6	31	Do.
J. N. Waugh and Son	Prairie Lawn, Nobby	3	28	Do.
W. J. H. Austin	Hadleigh Jersey Herd, Boonah	2	11	Do.
State Farm, Kairi	Kairi, *viâ* Cairns	4	16	Do.
H. D. B. Cox	Sydney (entered in brother's name)	3	16	Commonwealth Standard Jersey Herd Book
	GUERNSEYS.			
Queensland Agricultural College	Gatton	2	2	Eligible, but no Guernsey Herd Book of Australia

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—*continued.*

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
DAIRY BREEDS—*continued.*				
HOLSTEINS.				
Queensland Agricultural College	Gatton	2	9	Holstein-Friesian Herd Book of Australia
George Newman ..	"St. Athan," Wyreema	9	92	Do.
F. G. C. Gratton ..	"Fowlerton," Kingsthorpe	1	15	Do.
R. S. Alexander ..	Glenlomond Farm, Coolumboola	1	3	Do.
Ditto	Ditto	1	..	Holstein-Friesian Herd Book of New Zealand
S. H. Hoskings ..	St. Gwithian, Toogooloowah	..	..	Holstein-Friesian Herd Book of Australia
C. Behrendorff ..	Inavale Stud Farm, Bunjgurgen, Q.	3	9	Do.
E. Swayne	West Plane Creek, Mackay	1	2	Do.
ILLAWARRA.				
A. Pickels	Blacklands Stud, Wondai	4	62	Illawarra Herd Book of Queensland
J. T. Perrett and Son	Corndale, Coolabunia	3	43	Do.
W. T. Savage	Ramsay	2	22	Do.
Hunt Bros.	Springdale, Maleny ..	3	62	Do.
MILKING SHORTHORNS.				
P. Young	Talgai West, Ellinthorp	2	42	Milking Shorthorn Herd Book of Queensland
W. Rudd	Christmas Creek, Beaudesert	2	10	Do.
A. Rodgers	Torran's Vale, Lanefield	1	9	Do.
W. Middleton	Devon Court, Crow's Nest	3	27	Do.
A. K. Yorksten ..	"Dunure," Miles ..	2	8	Do.
W. H. Francis ..	"Exelawn," Colinton, Brisbane Valley Line	3	5	Do.
BEEF BREEDS.				
SHORTHORNS.				
T. B. Murray-Prior ..	Maroon, Boonah ..	2	37	Queensland Shorthorn and Australian Herd Books
C. E. McDougall ..	Lyndhurst Stud, Warwick (2)	25	100	Queensland Shorthorn Herd Book
Godfrey Morgan ..	"Arubial," Condamine	3	6	Do.
W. B. Slade	E. Glengallan, Warwick	2	20	Do.
HEREFORD.				
A. J. McConnell ..	Dugandan, Boonah	19	36	Australian Hereford Herd Book
E. M. Lumley Hill ..	Bellevue House, Bellevue	45	127	Do.
Tindal and Son ..	Gunyan, Inglewood	50	400	Do.
SUSSEX.				
James T. Turner ..	The Holmwood, Neurum	2	4	Sussex Herd Book of England

Dairying.

ITALIAN OR CACAVA CAVALLI CHEESE.

We are obliged to a Northern correspondent for the following description of the method of making this Italian cheese. The recipe is:—

If there is whey from the previous day put a little of this whey together with some of Hansen's or Barnecow's rennet into the milk, which it is best to have about 84 degrees F. Just put enough rennet that will show a firm curd in about half an hour. Should there be no whey from the previous day, let the milk stand for five or six hours before you put the rennet in so as to give the lactic acid a chance to work as well as the rennet. When the milk is firm enough to make a clean break as you go with the finger through it, cut it with a couple of knives or break it very gently with the fingers, then heat the milk very slowly to 96 degrees F. by either heating part of the milk over the stove or putting hot water round the vessel, stirring the milk a little with the hand so that the milk lets the whey go. The best way is to have two tubs of unequal size, the outer one for the hot water. The heating should be done very gently, and the curd will take four or five hours before it is ready, that is to say, sour enough, to rise and float. In the meantime it has to be divided often and very gently, otherwise the butter fat escapes. On no account let it get hotter than 100 degrees F. Towards the end draw off some of the whey. When the curd rises it is taken off the whey and cut into pieces the size of a marble; then hot water (nearly boiling) is poured on it and the whole stirred with a stick, when it will melt and is made by working with the hands into a rope. This is made into a ball by working it downwards and towards one point (something like working up a damper), putting the ball every now and then in the hot water to keep it soft and pliable. When worked enough (which is only known by experience), put it into salt and water for twenty-four hours (*not* in a galvanised vessel). For use as a fresh cheese and for toasting, the cheese is made into a three-strand plat and cut across the plat.

In Italy the cheese is made in the shape of calabashes, as there they hang the cheese (after salting) in the smoke of the kitchen for three days, and after that put it in the cellar.

SWEET POTATO SLIPS.

A very good idea for transporting sweet potato cuttings is that described in the January issue of the "Journal of the Jamaica Agricultural Society." In Queensland, sweet potato slips are cut and made up into small bunches for sale just as they are taken from the vine. The Jamaican cultivator adopts a different plan, which appears to be highly successful. In planting, or transmitting the slips, they are completely defoliated, with the result that the sap is conserved in them, causing them to make new growth quicker than when the leaves are left on merely to wither. It is especially in transporting slips that they should be defoliated.

On this point, an interesting experiment was made by the Superintendent of Instructors. He had supplies of potato slips defoliated, cut into short lengths, and sent by post, when several days elapsed before they were planted, added to which they were planted in dry weather. Very few of these cuttings failed to grow.

Defoliating potato cuttings before transporting anywhere will thus save weight and expense in transit besides making surer of growth when planted.

Reports received from growers of defoliated slips all agree in the good results obtained. One grower stated that out of fifteen slips planted in dry weather, without shade or water, twelve struck and grew well. Another reported that of twenty-five slips planted without water, when no rain fell for four days, twenty-three began rooting on the third day.

We have noted that sweet potato growers in this State, frequently, plant defoliated slips, but slips offered for sale in bunches usually retain their leaves.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, APRIL, 1920.

Considering the changeable weather, and the fact that the majority of the birds were in lay on arrival at the College, the output for the last week of the month was very satisfactory. The health of the birds at the commencement of the test was not of the best, warts, colds, and minor troubles being in evidence, but health was quickly regained. Four deaths occurred, viz.—R. Holmes (B bird), broken bloodvessel; Range Poultry Farm (F), ovarian inflammation; Chaille, inflammation of the bowels; J. Ferguson (F), ovarian inflammation. The feeding of the birds is improving daily, a sure sign that they are getting accustomed to their new conditions. The following are the individual records:—

Competitors.	Breed.	April.
LIGHT BREEDS.		
*G. Trapp	White Leghorns ...	106
*J. H. Jones	Do.	101
*Haden Poultry Farm	Do.	98
*O. W. J. Whitman	Do.	93
*J. Newton	Do.	92
*W. Becker	Do.	91
Geo. Lawson	Do.	89
*Quinn's Post Poultry Farm	Do.	87
*T. Fanning	Do.	82
*Mrs. L. Henderson	Do.	82
*G. Williams	Do.	81
*W. and G. W. Hindes	Do.	78
A. J. Anderson	Do.	77
Thos. Eyre	Do.	77
*E. A. Smith	Do.	76
*N. A. Singer	Do.	72
C. M. Pickering	Do.	72
*J. J. Davies	Do.	71
W. D. Evans	Do.	69
*Harold Fraser	Do.	67
*Thos. Taylor	Do.	65
*Dr. E. C. Jennings	Do.	64
*S. McPherson	Do.	60
*Mrs. L. Anderson	Do.	58
*S. W. Rooney	Do.	57
H. P. Clarke	Do.	57
Avondale Poultry Farm	Do.	54
*B. Chester	Do.	51
W. Morrissey	Do.	50
*L. G. Innes	Do.	49
*Range Poultry Farm	Do.	49
S. L. Grenier	Do.	48
C. A. Goos	Do.	47
C. Langsbecker	Do.	45

ALGAROBA SEED.

We frequently receive requests for information on the Algaroba-tree and its products, and particularly as to whence the seed may be obtained. Dr. Hastings Reed, of Cairns, has lately been good enough to offer to supply imported seeds of this tree upon receipt of application from those wishing to plant it. The only cost to the applicant will be the postage.

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	April.
LIGHT BREEDS—*continued.*		
*J. M. Manson	White Leghorns	45
E. Chester	Do.	44
Mrs. R. Hodges	Do.	42
S. Chapman	Do.	40
H. A. Mason	Do.	40
C. H. Towers	Do.	36
Nurse E. M. Ellis	Do.	29
R. C. J. Turner	Do.	25
HEAVY BREEDS.		
*R. Holmes	Black Orpingtons	[illegible]
*A. E. Walters	Do.	[illegible]
*D. Fulton	Do.	[illegible]
*W. Smith	Do.	[illegible]
*R. Burns	Do.	[illegible]
*Nobby Poultry Farm	Do.	[illegible]
*T. Hindley	Do.	80
H. M. Chaille	Do.	73
*A. Shanks	Do.	72
*E. Morris	Do.	67
*R. B. Sparrow	Do.	62
J. Muir	Do.	58
*J. Ferguson	Chinese Langshans	[illegible]
*E. Oakes	Black Orpingtons	[illegible]
*E. F. Dennis	Do.	[illegible]
R. C. Cole	Do.	[illegible]
Parisian Poultry Farm	Do.	[illegible]
*J. Cornwell	Do.	[illegible]
*A. Gaydon	Do.	[illegible]
G. Flugge	Do.	30
*E. Stephenson	Do.	21
J. E. Smith	Do.	14
Mrs. G. H. Kettle	Do.	11
Total		4,042

* Indicates that the pen is being single tested.

RESULTS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	20	17	19	16	18	16	106
J. H. Jones	18	18	19	17	20	9	101
Haden Poultry Farm	18	13	21	19	12	15	98
O. W. J. Whitman	15	14	18	13	15	18	93
J. Newton	21	8	18	15	12	18	92
W. Becker	18	19	20	9	9	16	91
Quinn's Post Poultry Farm	19	19	14	13	5	17	87
T. Fanning	8	14	13	14	15	18	82
Mrs. Henderson	9	17	17	10	19	10	82
G. Williams	6	15	16	13	19	12	81
W. and G. W. Hindes	9	15	18	13	7	16	78
E. A. Smith	18	15	15	8	12	8	76

RESULTS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued.*							
N. A. Singer	18	8	8	17	9	12	72
J. J. Davies	13	13	7	20	4	14	71
Harold Fraser	12	5	14	12	14	10	67
Thos. Taylor	15	14	3	11	8	14	65
Dr. Jennings	5	17	11	8	21	2	64
S. McPherson	13	9	11	11	16	0	60
Mrs. L. Anderson	14	13	7	6	5	13	58
S. W. Rooney	0	1	17	12	11	16	57
B. Chester	16	6	9	10	8	2	51
L. G. Innes	0	15	13	2	19	0	49
Range Poultry Farm	3	16	6	16	3	5	49
J. M. Manson	8	4	20	4	2	7	45
HEAVY BREEDS.							
R. Holmes	22	16	15	14	21	26	114
A. E. Walters	20	20	3	22	18	20	103
D. Fulton	19	20	4	1	19	21	84
W. Smith	19	21	19	21	3	0	83
R. Burns	20	4	21	2	17	18	81
T. Hindley	16	19	17	19	2	7	80
Nobby Poultry Farm	12	21	18	20	9	0	80
A. Shanks	6	5	12	18	10	21	72
E. Morris	6	18	21	0	4	18	67
R. B. Sparrow	16	0	18	18	0	10	62
J. Ferguson	15	10	9	15	4	1	54
E. Oakes	7	19	15	0	6	0	47
E. F. Dennis	3	0	22	0	0	15	40
J. Cornwell	21	17	0	0	0	0	38
A. Gaydon	0	20	7	0	0	10	37
E. Stephenson	12	0	4	5	0	0	21

CUTHBERT POTTS,
Principal.

CHICKEN POX.

Mr. Hindes, late Poultry Expert at the Queensland Agricultural College, some time ago sent to this Journal a recipe for the prevention of chicken pox or warts, truly saying that "Prevention is better than cure."

The disease is caused, in his opinion, by a disordered condition of the blood; it is therefore not advisable to wait until the warts appear, but to see that the blood is kept in good order; the chickens will then readily throw off the warts when they come. They generally appear in about February or March, principally owing to the grass being burnt up by the hot sun, causing a scarcity of green food.

The following will be found to be an excellent recipe for purifying the blood:—Take ¼ lb. of liquid extract of sarsaparilla, and ¼ oz. of iodide of potassium, and mix with half a gallon of water. Give each chicken half a teaspoonful once a day. If there are a number to be treated a very good plan is to mix it with the pollard, thus giving less trouble. Should the warts break out, touch them with citric ointment, and allow them to dry down to a black scab; this will be ripe in three days, when, if lifted off, it will take with it the little roots of the disease. The affected birds should be removed from the others, as the disease is contagious.

The Orchard.

LEMON GROWING.

Amongst the citrus fruits, the lemon takes a prominent place. The trees thrive admirably, not only on especially suitable soils, but even in indifferent soils if the latter are properly prepared. Both the rough and the Lisbon lemons are heavy bearers. Here we have a sample of the former grown by Mr. W. H. Lambert, Paddington, who obtains a very heavy crop, many of the fruits being in clusters of six, as in the illustration, in a similar way to the grape fruit, to such an extent that the branches were weighed down with them.

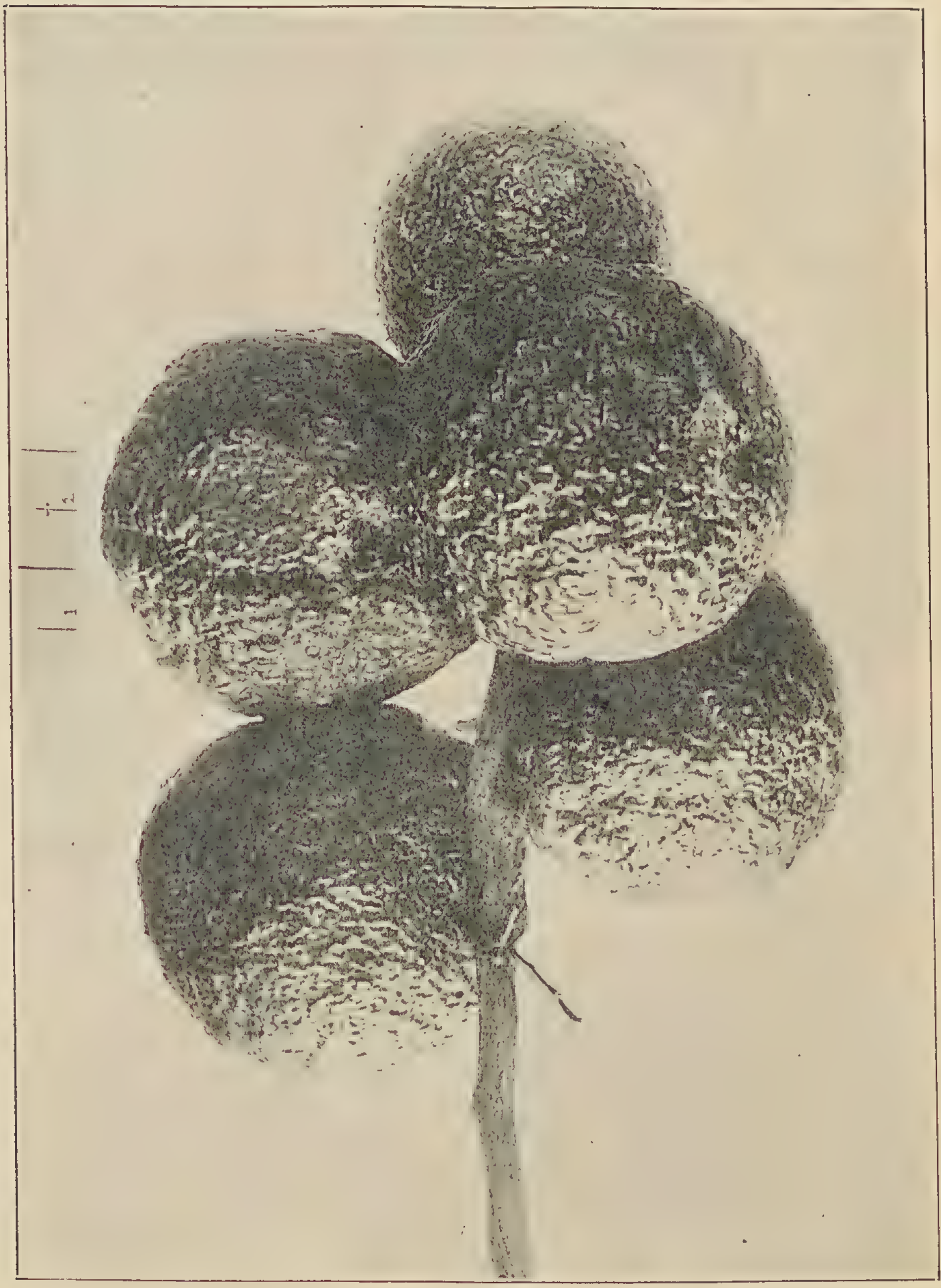

PLATE 17.—CLUSTER GROWTH OF ROUGH LEMONS.

Horticulture.

TOWN PLANNING AND HORTICULTURAL SOCIETIES.

Address delivered at the Monthly Show of the Horticultural Society of Queensland, held in the Albert Hall, Brisbane, 11th May, 1920, by Mr. F. W. Turley, Curator, Queen's Park, Ipswich.

No doubt you have all read the short paragraph on the front page of our monthly schedule. Allow me to read it to you by way of introduction.

''The objects of this society are to encourage and promote the cultivation of plants and flowers, fruits and vegetables, and the holding of monthly shows for the examination and exhibition of plants, &c., and the delivery of lectures in connection with horticultural subjects.''

You will agree with me that these are very worthy objects, and I must congratulate the enthusiastic members of this society, some of whom have grown grey in this good work.

This useful hobby has added years to the lives of many people, and, like music and art, it has helped to mellow and sweeten the dispositions of those who have had the good fortune to be brought under its charms.

The displays in this hall are generally a feast for the eyes and are decidedly educational.

The high quality of the plants and flowers, fruits and vegetables, is inspiring and must create in those who view them a desire to emulate the successful and enterprising growers.

Very often new and rare specimens are exhibited and are of especial interest.

Not long ago a very large and varied collection of ferns was sent from the Botanic Gardens—many of them were the choicest varieties in cultivation, and some were seedlings raised in the Gardens. Each plant was named, and this enhanced the value of this very fine exhibit.

The floral work is a striking feature of the monthly shows, and has become a fine art. The colour-blending and general effect is sometimes a ''dream.''

I am always sorry that so few boys and girls see these beautiful displays.

Many years ago I endeavoured to encourage the system of admitting children to shows, either free or for a very small charge. At any rate, every encouragement should be given to children to visit shows. This may reasonably be calculated to give a love of horticulture for the rest of their lives. There is a great need to educate the children in this direction, as there is only a very small number of young men at the present time who are qualifying for responsible positions in the horticultural world.

But ''Town Planning and Horticultural Societies'' is my subject this evening.

No matter how much good work has been done by horticultural societies in the past, there is room for improvements and extensions.

With the advance of the science of town planning, horticultural societies will be called upon to play an important part.

During the town planning conference of 1918 this society did very useful work in connection with the judging of gardens and in organising the horticultural display at the Exhibition buildings. This part of the programme will always fall to the lot of societies of this kind.

What I particularly wish to draw attention to is the need for improving the streets and the landscape.

In town planning, everything counts—buildings, streets, gardens, and a variety of details—it includes the useful and ornamental.

Every well-kept garden is an acquisition to the general plan. Every untidy garden is a blot on the landscape.

I strongly favour separate competitions for front gardens and back gardens. It should be understood that the front garden is ornamental and an acquisition to the street. The back garden is for fruit and vegetables. For town planning purposes the front garden is of first importance. For the family the back garden holds premier position.

It may not be out of place to give a prize for the best garden in a street or a locality—taking in several streets—without any need for entering a competition.

As the whole thing is for the improvement of the town or city it would not be too much to ask the local authority or Government to help in the prize-giving.

Many people would have much better gardens if they could get a few hints from some competent person regarding the arrangement of them, and some are not in a position to pay for it. Could horticultural societies do something to help these people, or will town planning authorities supply the need?

The landscape will be improved more or less by each good garden. This applies particularly to a city like Brisbane, where the land is so strikingly undulated. The hills and valleys lend themselves generously to the landscape gardener. Every householder has the privilege of doing his "bit," and the whole thing provides beauty for everybody who has eyes to see. Those who live on the hills look down on the beauties of the valley, and those who live in the valley look up to the grandeur of the hills.

It would be quite a mistake to allow anyone to think that the science of town planning is a new thing. We may not have heard much about it until recent years, but many worthy citizens have been busy at it for many years. Unmistakable evidences abound everywhere. They are to be seen as we travel by train, tram, steamer, or any other way. Positive beauty spots are constantly meeting the eye. Exquisite views are to be met with in and around Brisbane; some cannot be excelled anywhere. In many cases the natural beauties have been added to by enthusiastic citizens, but there is still much unconquered country and many unconquered gardens.

In a climate like our own the possibilities in the realm of horticulture are practically unlimited. The almost endless variety of palms and gorgeous flowering trees and shrubs that can be grown in this part of Queensland makes it a comparatively easy matter to make any garden beautiful.

At last monthly meeting, Mr. Bick gave us some impressions of gardens in the Southern States which were full of interest. Fabulous sums are spent on gardens in those States. Our own State could easily eclipse the other States, provided the same amount of cash was available.

In conclusion I would like to say that my object in writing this paper is to draw attention to the need of encouraging the improvement of gardens generally, and to make them more valuable from a town planning point of view.

It is not necessary to spend a great deal of money in making a garden attractive. If it is planned on economic lines the cost of maintenance can be reduced to a minimum. I have often seen people in starting a home lay out their garden in a style that I was quite sure they would never be able to keep up—while it would have been equally attractive at half the cost.

If properly laid out and well managed, no matter whether it is large or small, your garden will be a source of real pleasure and you will have the satisfaction of knowing that you have done your "bit" towards town planning.

ELEPHANT GRASS—ALGAROBA SEED.

Referring to our articles on Elephant Grass in the last issue of the Journal, Mr. W. Brotherton, Gladstone, writes:—"I am glad to see that interest is still being taken in that excellent fodder plant, Elephant Grass. The photograph shown in last month's Journal depicts the grass left too long uncut. If cut at from 2 to 3 feet high, which height it will attain every month or so, it yields a heavy crop of excellent feed. I have been cutting mine all through the drought, and it is still green although we have had no rain worth mentioning since January last." Mr. Brotherton, Brothertonville, Gladstone, says that he can supply seeds of the Algaroba tree to anyone requiring them.

Tropical Industries.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigations from the Entomologist, Dr. J. F. Illingworth:—

The continued showers during the past month have done much to improve the appearance of the cane. Though the colour is excellent in most places, the growth is far from satisfactory for this season of the year; it is still necessary to use the scarifiers, because the cane has not closed in sufficiently to keep down the weeds. This does not look very promising for cutting these fields during the season, especially since cool nights are already setting in.

The beetles continued on the wing very late this year at Greenhills—I found them on the feeding trees rather abundant until the 25th of March. This must be a record, for they usually disappear about the 1st of February. Of course, the rains started very late; still, the beetles continued to emerge for a much longer period than is customary for them.

Let me again impress upon the growers that the use of arsenic as a control measure for grubs is still under experimentation. As indicated previously, I am not yet ready to recommend it for extensive treatment. The past season was so unfavourable, due to the continued drought, that I was not able to take advantage of late planting for trying out experiments of placing arsenic in the drill with the plants. I am more and more confident, however, that this method of application will be best. Furthermore, since we have demonstrated that even a large quantity of this non-soluble poison does not appear to have any injurious effect upon the cane plant, I am inclined to use much larger doses—as much as 80 lb. per acre. But even this quantity is comparatively inexpensive if results are assured.

If I can get one more successful growing season I will probably be able to advise more definitely, not only the best method of application, but also the proper amount of the poison to use.

DEVELOPMENT OF *LEPIDIOTA ALBOHIRTA* (GREY-BACKS).

As indicated last month, all stages of the pest were present in the soil at Greenhills at the same time—eggs, first, second, and third stage grubs, and ovipositing beetles. This is a very unusual condition, due probably to the excessively long wait which the beetles were forced to undergo in their pupating chambers.

Usually the majority of the grubs reach the third stage by the end of January; the cane then shows the worst signs of devastation before the end of February. This year, however, the cane is still of good colour on the 15th of April, though the activity of the grubs is showing in the "piping" of the leaves. This rolling-up of the leaves is always noticeable for some time before they begin to turn yellow and die; evidently this is due to the lack of moisture in the plant when the roots are eaten off.

As an indication of the development of the grubs under very favourable conditions as to soil, and so forth, it will be interesting to repeat:—3rd March, only about 10 per cent. had reached that stage; 15th March, between 40 and 50 per cent. had gotten to the second stage, and a very few were in the third or final stage; 29th March, I found 20 per cent. in the first stage, 70 per cent. in the second stage, and 10 per cent. in the third stage; 9th April, less than 1 per cent. were in the first stage, about 74 per cent. in the second stage, and 25 per cent. in the third stage. Hence it will be the end of April before all the grubs reach the third stage.

In the fields where these grubs are so abundant it is encouraging to observe that the parasitic wasps (*Campsomeris* sp.) are rather numerous, the males flying about over the surface of the ground, thus indicating that their mates are destroying the grubs beneath.

ARSENIC FOR GRUB CONTROL.

After observing the apparent lack of success in the fields where I had applied arsenic to the ratoons, by placing it in furrows alongside the stools, I decided upon more drastic treatment, that I might observe the results of arsenic under field conditions, placed right in the spot where the grubs were active. Hence, I lifted a number of stools out bodily, and mixed the poison with the soil before resetting them; the grubs, which averaged 20 per stool, were all returned. In this treatment arsenic was used at the rate of about 80 lb. per acre.

The experiment was started on the 15th of March, then the grubs were pretty well advanced, some even in the third stage. The results were noted by digging out a few of these stools from time to time, and observing the number of dead grubs.

Four days, 14 per cent. dead.
Seven days, 24 per cent. dead.
Ten days, 34 per cent. dead.
Twenty days, 70 per cent. dead.

These results would appear to be very satisfactory from the standpoint of killing the grubs, but, of course, the method of application is not to be recommended. However, if the poison was placed in the drill with the plants, it would be in a similar position to the above—among the roots, whenever the young grubs became active. Then, too, the grubs would probably die much easier, when newly-hatched, if the poison was ready for them at that time; hence they would never reach the destructive stage. In line with this, it is the general experience of economic entomologists that a considerably less dose is required to destroy insects in the very early stages.

I have noted some published criticism, which evidently originates from a lack of experience of general science, stating that in using arsenic for the control of the grubs I will probably poison the cane juice and the sugar, and hence it will be detrimental to the health of the populace. With but little knowledge of chemistry, one would know how easy it is to detect even the smallest quantity of arsenic in a solution. Moreover, we are using arsenic in the insoluble form, which has no apparent action upon the cane plant; and probably lies inert in the soil until eaten by the grubs, when it is acted upon by their digestive juices, rendering it soluble and effective. Furthermore, arsenic that we use for the destruction of trees and other plants is first made soluble by combining with an alkali, such as soda or potash.

THE SUGAR INDUSTRY.

BUNDABERG AND MACKAY.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Mr. J. C. Murray, Field Assistant to the Bureau:—

Throughout the month of April the canegrowing areas of Gin Gin, Bingera, and Mackay have been visited.

BINGERA.—This area was at the time of visiting suffering very much from lack of rain, especially on some of the smaller holdings. On the plantation itself the intensive cultivation methods adopted by the management had been having a good effect on that cane which had not received too severe a setback, and should rain fall in sufficient quantities during May or April, the results at the end of the season may not be so disappointing as they look now. However, the management have decided that a vigorous irrigation policy is the only proper course for the future, and with that end in view they are planning accordingly.

Bingera is admirably situated for irrigation, and, although a considerable amount of work of this nature has been done in past years, the company have arrived at the conclusion, and rightly too, that the only successful way to produce sugar on the Burnett is to irrigate. The soil is rich and the danger from frost negligible if water in sufficient quantities could be supplied to the cane before it weakens from want of nourishment.

With regard to cane varieties growing at Bingera, there are no new canes since last visiting this area.

GIN GIN.—Many growers are busy cultivating, and some are planting, but, taking the industry collectively, the uncertainty of the season is causing a good deal of stagnation. As previously mentioned, the Demarara variety seems to be the most vigorous, it being difficult to say how the other canes will fare towards the winter. No. 1900 is a fair cane at Maroondan. More intensive cultivation would greatly assist the plant crop to resist the dry weather.

MACKAY (Racecourse and Farleigh sub-areas).—Mackay canegrowing areas are not looking nearly so well as they should be at this time of the year. Most of the cane is very backward, especially that growing on the higher land. However, during the month some fine rain has fallen, and this combined with the good growing weather that still prevails, should benefit the cane considerably.

Fertilising and liming are not being done to any extent, probably on account of the high price of the commodities. It costs approximately £5 a ton to obtain burnt lime at Mackay.

Many of the smaller growers are having a hard struggle to carry on, but the general opinion amongst them now is that they will be able to work with a greater measure of success owing to the increased price of sugar.

With regard to the Racecourse area, a great deal depends on how the last July plant crop shapes.

There is practically no standover cane left and the ratoons, what little there are, are very poor. It is probable that the poor ratooning was due to the too rapid growth made by the cane last year, and the stools to a great extent died.

The principal varieties growing are Clark's Seedling, D. 1135, Badila, and 1900 Seedling. These two latter canes are thriving and giving good returns on the rich alluvial flats along the Pioneer, but on the higher land, on the more moderate soils; D. 1135 and Clark's Seedling are more generally grown. Q. 813 is doing well, although mostly it has as yet not had a fair trial. The soil on these Racecourse areas tests with an acid reaction, and could mostly do with a lime dressing. Green manures are very necessary also, the soil being low in vegetable matter in many instances. An outstanding feature of the cane-growing industry here is the high sugar content of the average cane. Clark's Seedling is probably the best tester, farmers frequently getting over 18 c.c.s.

Cane pests are giving very little trouble at present. No serious complaints have been heard in this respect.

On Farleigh conditions are, with regard to crop growth, very similar to those at Racecourse.

Much of the cane is showing the effect of the dry spell, especially the plant crop. Farmers are busy planting at present, the ground being in very fair order after the recent rain. There appears to be a good supply of plants. Farmers now realise the importance of changing their plants, and this is effected as frequently as necessary.

A local farmer, Mr. Hodge, has invented a really excellent implement for loosening the tilth subsequent to planting. Four acres a day can be done, and more effectively than using the hoe. The practice of ploughing in the interspaces between young plant cane is bad, and should be discontinued.

Yuban is being grown by some farmers, but it would probably be a mistake to plant in any way extensively. There are many characteristics about Yuban that do not commend it either to the miller or the cutter.

Field work has been considerably delayed by rain, especially at Sarina, where very little opportunity was afforded for having a detailed visit. However, from what could be observed, the rain will benefit the crops immensely, and there should not be by any means such a low crushing as previously anticipated.

The following varieties are doing well, and still remain the staple ones:—Clark's Seedling, Badila, 1900 Seedling, D. 1135, and H.Q. 285. There is not much of the latter, however. The completion of the railway will greatly benefit Sarina, and make available much good land at present lying idle.

TO COTTON-GROWERS.

It was stated in Farm and Garden Notes for May (in the April issue of this Journal) that an advance of 4d. per lb. would be paid to cotton-growers on delivery of the cotton at the Government Ginnery in Brisbane. This should have read 3d. per lb. When the cotton has been marketed, the Commonwealth Government guarantee that growers will receive a minimum of 4d. per lb., and any additional profit resulting from the sale of the cotton, after marketing and expenses therein, will be divided *pro rata* amongst suppliers.

Botany.

THE WEIR VINE (IPOMÆA CALOBRA).

WITH NOTES ON ITS REPUTED POISONOUS PROPERTIES, BASED ON INFORMATION SUPPLIED BY DONALD GUNN, ESQ., M.L.A.

By C. T. WHITE, F.L.S., Government Botanist.

Description.—A creeping plant, roots producing underground sweet-potato-like tubers. Leaves long-stalked, somewhat heart-shaped, fairly large, sometimes over 4 inches across. Peduncles (flower stalks) about as long as the leaves, bearing several flowers. Flowers about 3 inches long, corolla changing from pinkish red to blue. Seed capsule globose-ovate, ¾ to 1 in. diameter, containing several blackish angular seeds.

Distribution.—It was first collected by the late Walter Hill, one time Government Botanist of Queensland and Director of the Brisbane Botanic Gardens, in the mulga country of the Barcoo River. It is fairly common in the hard red soil (mulga country) of the Maranoa District.

Names.—According to Walter Hill it was known to the aborigines on the Barcoo as ''Calobra,'' and this name was used by Baron Mueller and himself in specifically designating the plant. About 1880, R. Fitzgerald collected specimens of the vine on the Moonie and Balonne Rivers, and in forwarding specimens to Baron Mueller, then Government Botanist of Victoria and the leading authority on the Australian flora, stated that it was known to the aborigines about those rivers as ''Weir,'' and this name seems to have stuck to the plant, it being generally known as Weir Vine in the Maranoa District, with the occasional variant of ''Gueeah Vine.''

Properties.—Up to the present the only fact I can find recorded about the plant is that the aborigines wherever it grew used the tubers as food. In December of last year, however. Mr. Donald Gunn, M.L.A., brought in specimens to this Department with the account that ''When sheep ate the vine they developed the symptoms of indigo-affected animals; they had a wild-staring look, with their eyes almost coming out of their heads. The plant grows in the red soil (mulga country) between Goondiwindi and St. George, and has a large handsome flower of the convolvulus type, changing from pinkish red to deep blue. The tubers or yams it produces grow at times to the size of one's hat.'' As such information was quite new to me, I asked Mr. Gunn if he was quite sure of the poisonous character ascribed by him to the vine. He replied in the affirmative and stated that his account could be corroborated by other practical stockmen, and, further, kindly forwarded on the following letter from his son, Mr. Donald D. Gunn, written from Quibet, Roma, under date 18th February, 1920:—

''Particulars of the 'Weir Vine,' which is the only name by which I know the plant:—This plant comes up as soon as heavy rain falls. The potato, yam, or whatever you like to call it, will keep in the ground for months, and, as soon as rain falls, comes up and grows quicker than any grass. It grows something like a sweet-potato plant and has a large, lily-like flower. Later on, when the flower falls off, a gherkin-like pod is left, which holds the seed. When the plant first comes up, stock can eat it and they will fatten on it. It is the pod that does the harm to stock; at least, that is my opinion. The plant affects stock something like the 'Darling Pea.' Cattle will try to catch their tails, and go dim in the eyes. I have only had a few affected with it, and I have been amongst it for nine years, so it is not very deadly. Horses that take to it 'go' in the eyes, try to climb trees, rear up, &c. Sometimes they 'go' in the loins; the same with cattle, and if they do, that is the end of them. The yam can be used as a potato. I know a woman who

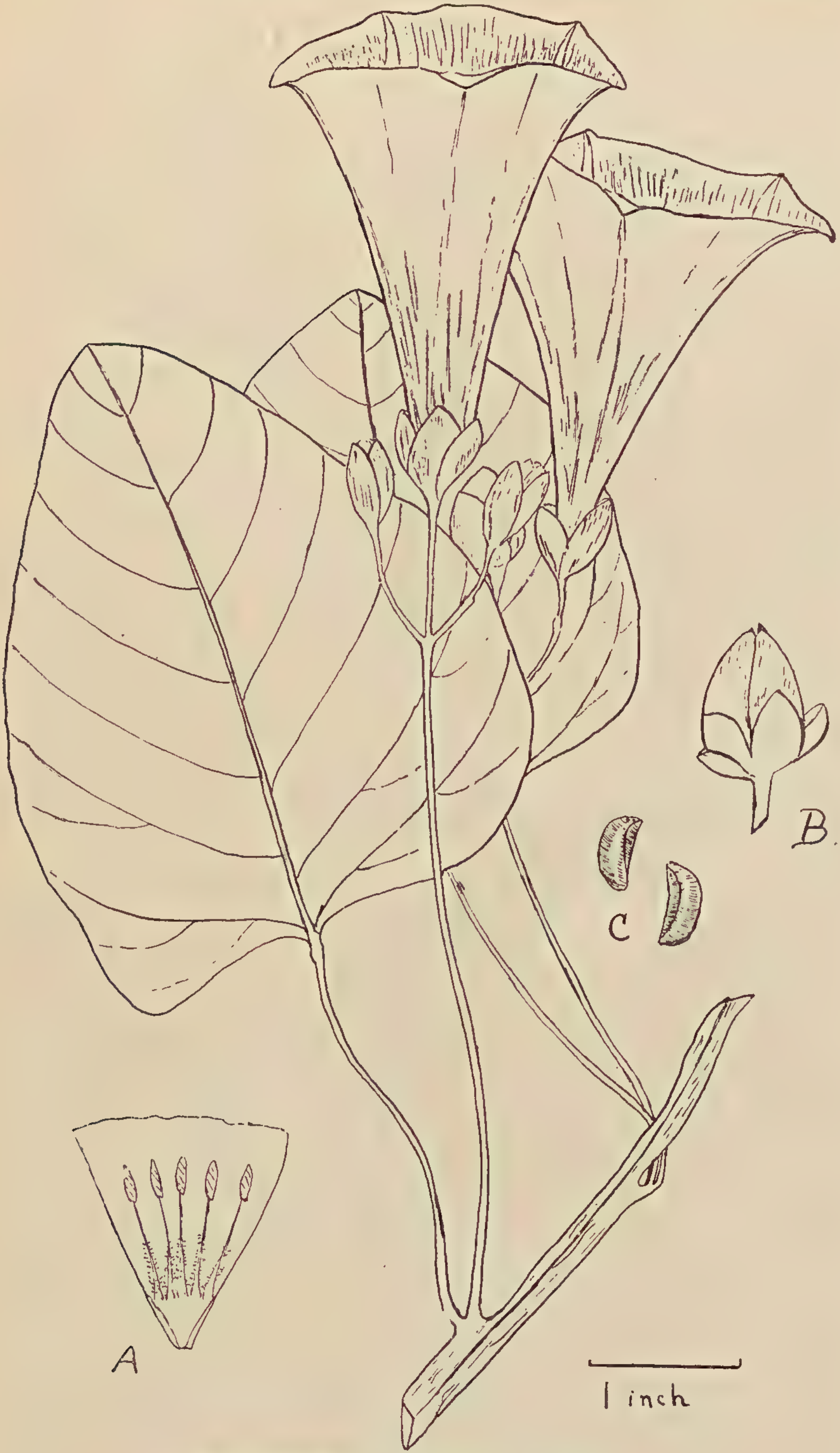

PLATE 18.—WEIR VINE (*Ipomœa calobra*).
A. Base of corolla laid open to show stamens. B. Capsule. C. Seeds.
The whole reduced to the same scale.

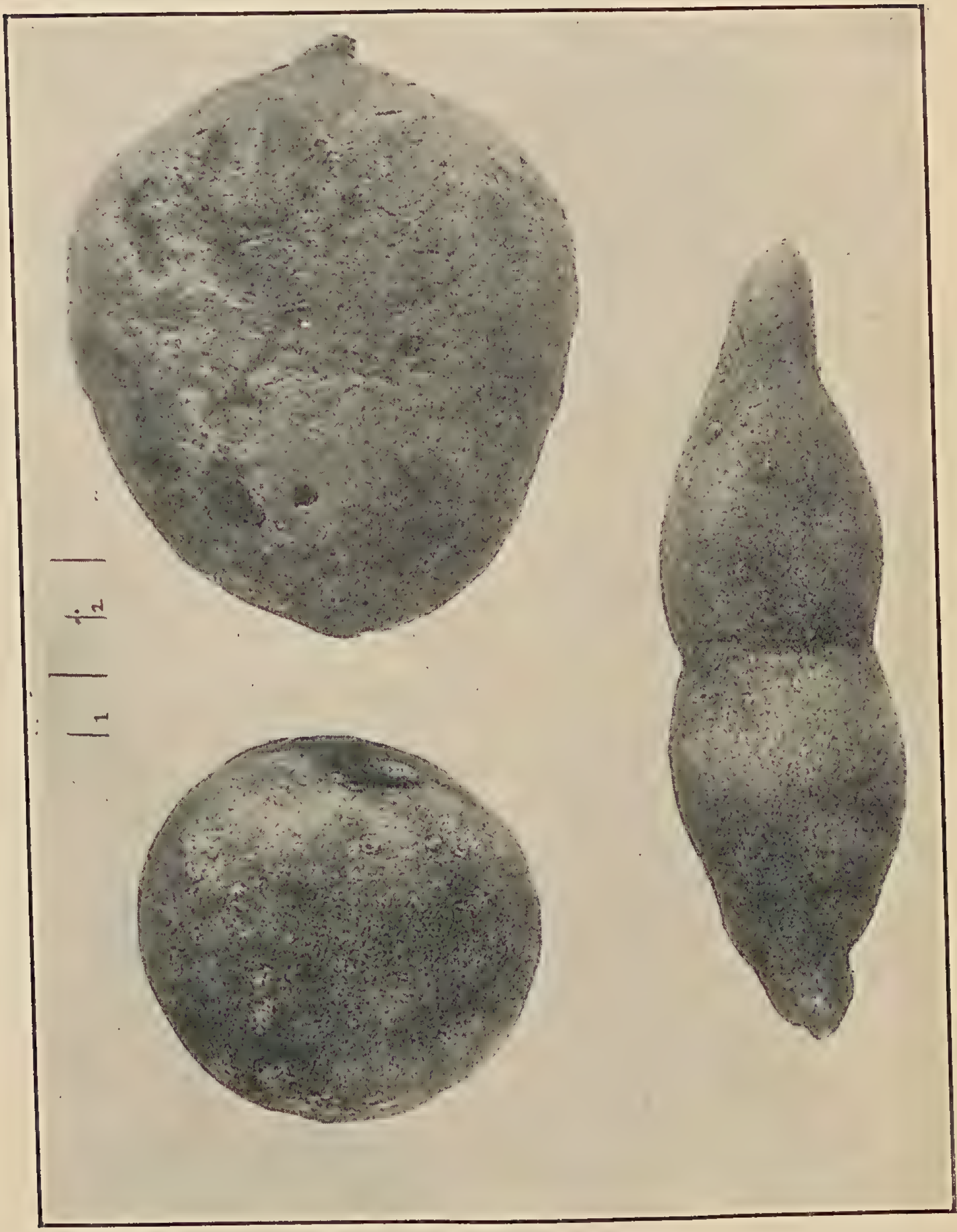

PLATE 19.—TUBERS OF THE WEIR VINE (*Ipomœa calobra*).
The measurement alongside represents inches and half-inches.

used to boil the young and tender ones and use them the same as potatoes, and she told me that they were not bad eating. The only way I have eaten them is to dig up the yam and suck the juice out as a substitute for water. One need never die of thirst where the Weir grows. If there are no growing plants, have a look round and you will find the ground cracked and fissured with the fissures radiating outwards; dig down and you will get the yam, sometimes only a foot under the surface, and sometimes deeper. When the yam gets very old it dies and leaves a hollow in the ground under the surface. If you ride over the spot after rain when the ground is soft and your horse puts his foot down over the hole, he will go straight down up to his knees or thereabouts and leave a nasty trap for the next man. I have had several falls through the presence of these holes.''

Notes on the Genus.—The genus *Ipomœa* is a large one, widely spread over the world. About forty species are natives of Australia, and nearly all the Australian species occur in Queensland, though they may extend to the other States and, in some cases, have a wide geographical distribution beyond the continent. The genus includes most of the plants that are grown in gardens under the name of ''convolvulus'' or ''Morning Glory.'' It also includes the sweet potato. Some of the species possess purgative properties, as the roots of *Ipomœa purga*, the source of jalap. The seeds of other species, *e.g.*, *Ipomœa nil*, *I. hederacea*, &c., also contain a principle resembling jalap in its action. The leaves of some, *e.g.*, *I. batatas*, develop at times hydrocyanic (prussic) acid yielding glucosides, and losses among stock are sometimes thereby caused by them, but the symptoms of prussic acid poisoning would be quite different to those described by Mr. Gunn, which are those generally ascribed to species of *Swainsona* (Darling pea and indigo) in Australia, and *Astragalus* (loco weeds) in the United States, and other leguminous genera, and, so far as I can find, has not been recorded for any species of *Ipomœa* or other genus of the family Convolvulaceæ.

NEGLECTED INDUSTRIES.

PETROLEUM OIL NEAR BRISBANE.

We are pleased to know that active steps are being taken to prove the accuracy of Mr. Arthur Morry's theory that petroleum oil exists in enormous quantities in the metropolitan district, and at a depth that will bring it well within commercial reach. Mr. Morry has secured a license to prospect on 60 acres of what is known as the Abattoirs Reserve at Wolston, and a small company is being formed to undertake boring operations at once. Should success be obtained, it is impossible to overestimate the importance of the new industry to Brisbane and, in fact, to the State generally. A large number of local industries will be immediately benefited, commercial and shipping circles will enter upon a new life, and capital will flow into the State in abundance. Mr. Morry's optimism appears to be perfectly justified, as he brings an extensive and varied experience of scientific and professional practice to bear upon the subject, while his very strong opinions are backed up by the results of extensive original research work in several industries. He contends that all the favourable indications which are found in other large oil fields are apparent here.

It is known that, while oil may be found in all geological formations, the newest and oldest groups afford the largest supplies, and that all the largest oil fields of the world hitherto discovered are known to be in the tertiary formation, which is abundant in Southern Queensland; besides, Mr. Morry has also adopted some original methods of his own in calculating the position, depth, and thickness of the various oil strata. It is sincerely hoped that great success will attend his efforts, and every encouragement should be given to him in his earnest efforts to develop the resources of the State.

We understand Mr. Morry has also located an important rock salt deposit not more than 120 miles from Brisbane, and this, too, may become a very welcome and important addition to our Queensland industries.

Forestry.

HOW FARM FORESTRY PAYS.

Farm forestry may be said to be the handling of forest trees and woodlands in such a manner as to increase the income and the permanent value of the farm. This phase of forestry has never interested the ''man on the land'' in Queensland. Clearing off the timber by the firestick and ringbarking on large areas have been the main objects of farmers and graziers for the past fifty years.

As a contrast, let us see what the ''Farmers' Bulletin,'' issued by the United States Department of Agriculture, has to say on the subject:—

''Farming in the Southern States has progressed to the point where farm owners are interested in conserving all the resources of the farm instead of allowing some of them to be wastefully handled. Young trees are generally recognised to be the foundation for the future crop of timber, and worth considerable care and attention. Now that the original growth of pine and the largest and most valuable hardwoods are nearly all gone from the farms, old-field pine and second-growth timber compose the woodlands and are the subjects of chief interest. Rapid-growing kinds of trees are favoured and, as a rule, slow-growing trees are being eliminated.

''Valuable and useful trees on the farm are a sort of savings bank account, which, if rightly handled, may be drawn upon each year without reducing the principal. Since timber and wood are required for the successful operation of a farm, and since most farms have more or less rocky, steep, wet, or poor soil, that is best adapted to tree growth, the handling of woodland is legitimately a part of farm work.

''In addition to the value of the home forest as a source of direct income to the farmer each year, there is another way in which it has a very distinct worth. Woodland and trees scattered about the farm undoubtedly increase the value of the place to a much greater extent than the actual selling value of the standing timber. Belts of woodland protect the growing crops, as well as the live stock and man, from cold or parching winds. Trees should be maintained on every farm not only as a source of income but also because they make living on the farm itself and in the community more comfortable and attractive.

''The forest lands held by farmers in the Southern States constitute a total of about 124,000,000 acres, which is more than one-third (35 per cent.) of all the farm lands of that section.* It may surprise some to know that farm woodlands represent more than one-half of the entire forest land in the Southern States, including the great holdings of the lumber companies, and yield annually about 94,000,000 dollars worth of timber products.† Of this amount nearly one-half is sold in the form of logs, other cut products, and as standing timber. The remainder is used on the farm.''

THE COTTON SEASON.

It is requested that cotton growers will consign their crops to the departmental ginnery as early as possible in the coming season. If farmers having small crops would combine to forward the produce, a considerable saving in freight and cartage can be effected.

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* The States referred to in this group include the 15 which follow: Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida (26 northern counties only), Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas. The figures given in this bulletin are based upon the last U. S. Census (1910), the latest information available.

† Value of timber products in 1919, on account of enhanced values and probable increased cut, estimated at about 140,000,000 dollars.

Entomology.

NOTES ON A LITTLE-KNOWN LEAF-EATING AND STEM-BORING BEETLE.

By E. JARVIS, Assistant State Entomologist.

A rather interesting infestation of a small patch of third ratoons by the chrysomelid beetle *Rhyparida morosa, Jac.*, was observed by the writer on 19th January, 1920, at Pyramid, in the Cairns district.

This insect, which was described and figured for the first time as a cane pest in 1916, is about a quarter of an inch long, of very convex shape, and uniformly black and shining, occasionally with a bronze tint. Its head is hidden nearly to the eyes in the prothorax, and the antennæ are reddish-brown with eleven joints of about equal length, the first five lighter in colour, more slender, and less hairy than the remainder. The prothorax and elytra are punctate, the former irregularly and finely, the latter coarsely, with punctures arranged in curved lines as indicated on drawing; scutellum semi-circular. Length, 6 m.m.; greatest width, 4 m.m.

HABITS OF THE BEETLE.

During the heat of the day these beetles may be found resting deep down between unfolding heart-leaves, and if disturbed usually run upwards, seeking to escape by crawling outside and taking to wing. At such times, however, one can often catch them with the fingers, as they do not attempt to fly until getting clear of the centre of the plant. The presence of this pest is at once betrayed by the characteristic appearance of the damaged leaf-blades (see fig. 5), which does not in the least resemble grasshopper injury. Like many of our small plant-eating beetles, the species in question feeds mostly during the cooler hours, dropping hastily from the leaves or taking flight when approached. At 7.15 a.m. 22nd January, on a cloudy morning, they were observed crawling over and eating holes in cane leaves at Pyramid, while later in the day, the sky still being overcast, specimens were noticed feeding in a similar manner on the leaves of "blady-grass" (*Imperata arundinacea*), the native food-plant of this insect.

Specimens confined in cages containing growing cane plants feed in a normal manner, three beetles during a period of four days being able to severely cripple a plant about 15 inches high.

The adult beetles are somewhat gregarious in habit, and often occur in clusters of twenty or more, side by side, on the ends of young twigs of *Ficus opposita.*

MODE OF INJURY.

After glancing at the accompanying photographs (figs. 4, 5, 6), the reader will in future no doubt be able to recognise the presence of this pest among his cane. Figures 4, 4, 4 are taken from cane leaves attacked by caged specimens of *morosa*; fig. 5 from leaves eaten by this species in the field; while figs. 6, 6 are photos of damaged "blady-grass."

The infestation at Pyramid extended more or less throughout the area affected. A number of plants had suffered considerably, many of the leaves in such cases being somewhat ragged-looking and edged with fragments of dead brown tissue, representing such portions of the leaf-blade lying between large holes as had been cut off from the usual supply of moisture, and consequently dried up.

HABITS OF THE LARVA.

The grub of this species was discovered under rather peculiar circumstances. On 7th January, whilst studying the economy of our smaller moth-borers of cane, one of the many "dead hearts" examined was found to contain a coleopterous larva which had eaten a central tunnel about three-quarters of an inch long at the base of the sucker. This grub was placed in a cage containing damp soil, into which it at once burrowed, and nine days later had pupated in an egg-shaped chamber at a depth

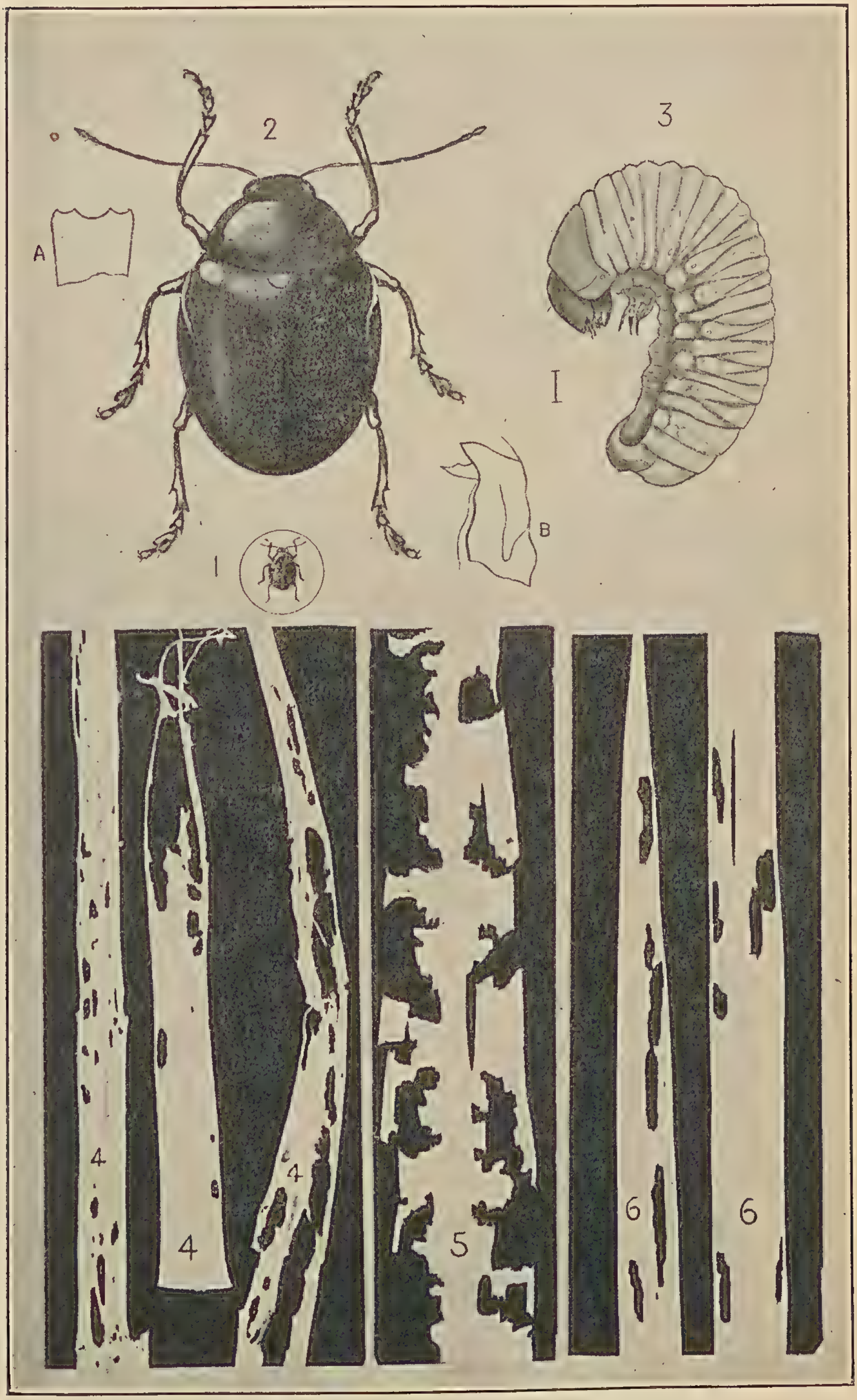

PLATE 20.—RHYPARIDA MOROSA, *Jac.* (Family CHRYSOMELIDÆ).

of about one and a-half inches. By 25th January (an interval of nine days), transformation to the imago stage was effected, the beetle, which proved to be *Rhyparida morosa,* then being of the normal bronze-black colour and able to fly.

Three days earlier, however (on 22nd instant), happening to notice a patch of "blady grass" at Pyramid affected by some borer, I was interested to find the insect in question the responsible agent, and, moreover, that it occurred quite commonly in the succulent underground portions of the stalks of this plant.

Upon tearing off the loose brown basal sheathing of affected stems, a hole in the side about one-sixteenth of an inch in diameter was exposed, out of which before many seconds a grub, if at home, usually emerged tail foremost, and endeavoured to escape. By the aid of its spined tarsi and several transverse rows of abdominal bristles this larva is able to crawl over level ground rather quickly.

A number were transferred to breeding cages, and in due time produced specimens of *Rhyparida morosa, Jac.*

The above incident appears worth recording, since it serves to illuminate the life history of an insect which, although at present of minor importance as a leaf-eating beetle, has now been found capable of inflicting more serious injury to cane during its larval condition. In all probability a certain percentage of young ratoon suckers growing close to the headlands or road sides covered with "blady grass" are often killed by this insect.

DESCRIPTION OF LARVA (Fig. 3).

General colour yellowish-grey, a faint indication of a whitish median band; head shining reddish-brown, mouth parts darker; prothoracic plate large, pale shining yellow; stigmata protruding slightly, light pink, the outer edge forming a dark-red circle; venter of five terminal abdominal segments with transverse rows of stiff brown bristles. Surface of body finely granulate; legs rather long, terminating in a sharp brown curved claw; tibiæ with about three stout bristles on ventral portion. Length in natural doubled-up position, 4.50mm. (three-sixteenths of an inch).

DESCRIPTION OF PUPA.

At first whitish-yellow but gradually darkening from sixth to ninth day. Body sprinkled sparingly with brown hairs seated on conical tubercles; distal extremity of hind femora with *one,* and obtuse point of anal segment with *two* rather large brown thorn-like claws. Length, 4 m.m. (nearly three-sixteenths of an inch).

At present this insect, being of minor importance, does not call for repressive measures.

It is probably preyed upon by many natural enemies, one of which is an "Assassin bug" (Reduvfidæ), that is predaceous upon the adult beetle. From a larva obtained 30th January, I bred a Tachinid fly (undetermined) which emerged 18th February.

Reference to Plate.

1. *Rhyparida morosa, Jac.* (natural size).
2. The same (magnified). A. Labrum of same. B. Mandible of same (magnified).
3. Larva of same (magnified).
4. Injury to cane leaves (from pot plant).
5. Injury to cane leaves (from cane field).
6. Injury to leaves of "blady grass."

Drawings and Photos original.

MANURING COW PEAS.

A cowpea crop of 15,000 lb. of green vines per acre will contain 100 lb. of nitrogen, 67 lb. of potash, and 22 lb. of phosphoric acid. Therefore, three times as much potash as of phosphoric acid will be required. The plant draws its nitrogen from the air, therefore only phosphoric acid and potash need be supplied directly.

General Notes.

A REAL NON-SKID TYRE.

In the March issue of the publication of the ''Industrial Publicity Service,'' London, amongst many interesting items is one describing a reliable non-skid rubber tyre. Legions of inventions have been made to prevent the skidding of rubber tyres, but no one device can be said to be completely satisfactory, either in obviating side-slip or in avoiding damage to the roadway and to the tyre itself. Chains, studs, and all sorts of rubber protuberances have been tried without real success. A British engineer has, however, been working along much simpler and more scientific lines with most promising results. His notion is to shape the tyre so that when it is in contact with the road it lies flat, with a definite edge on each side. Any tendency to skid is resisted by the ''squeegee'' action of the tyre in this position. Trials have shown that incipient side-slips are quickly checked, and that the tyre wears well, and has no bad effect on road surfaces.

TANNING MARSUPIAL AND OTHER SKINS.

Since the opening of the present season for trapping opossums we have received numerous letters asking for instruction in curing and tanning these and other skins. Perhaps the following recipes will prove satisfactory. The general principle is to trim off the useless parts of the skins and remove all fat from the inside. Then soak the skins in warm water for about an hour. Then apply a coating of borax, saltpetre, and Glauber's salts—1 oz. of each, dissolved in sufficient water to make a thin paste. On the following day, give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This latter mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for 24 hours. Then take 4 oz. of alum, 3 oz. of salt, and 2 oz. of saleratus; dissolve these in hot water, and when cool soak the skin in it for twelve hours. Wring out, and hang up to dry. If you find the skin not sufficiently soft, repeat the soaking and drying two or three times.

Another method is, first to remove the flesh and fat. Then wash the skin in a solution of sal. soda and water. Take 4 oz. of powdered alum, 8 oz. of salt, 1 quart of new milk to 4 gallons of salt water, and 1 pint of prepared starch. Stir well, and then put in your fur skins. Air them often by hanging them over a stick laid across your tan tub. Handle this occasionally until they have been in the liquor for a day or two. Then remove the skins and add to your liquor a *half* teaspoonful of sulphuric acid. Stir this well into the liquor. Put the skins back and steam them well for about an hour. Then take them out and wring and rinse off in soft, luke-warm water, and hang them up in a cool place, and when they begin to get white work and stretch them till they are dry.

Hides of larger animals, such as kangaroos, calves, &c., should remain longer in the solution.

To cure a tough skin, trim it on the flesh side with a sharp knife and then well brush with a solution of 2½ lb. of alum and 1 lb. of common salt in 1 gallon of warm water. The skin should be treated two or three times with this solution on successive days. Now sprinkle bran all over the skin, brush out, and nail the skin to a board to dry it.

Note that each kind of skin requires some special treatment, that is, all skins cannot be tanned in the same manner. But the general principle is the same as above.

Still another method is by what is known as ''the lightning tanning process,'' which is said to be the quickest method of tanning wallaby, rabbit, and other skins, and is very simple. It is as follows:—Pour five or six quarts of boiling water over two quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to blood-warm water as much salt as it will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than luke warm) add an ounce of sulphuric acid ($H_2 SO_4$). Immerse the skins in the liquor, stirring them occasionally until tanned, which will be in about twenty minutes. When tanned, rinse in clean water and hang out in a shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft and white.

CHEMICAL TREATMENT OF TREE STUMPS.

A correspondent writing to the "New Zealand Journal of Agriculture" (April 20) asked for advice as to the procedure for dissolving large stumps and kauri leads with sulphuric and nitric acid. To this the "Fields Instruction Branch" replies:—

"We would suggest as an alternative treatment the use of nitre (potassium nitrate) as sulphuric acid is now quoted at £22 a ton, and nitric acid, which is difficult to procure at the present time, is much more expensive. Bore a number of 2-inch holes into the stumps to a depth of about 6 inches and plug them with nitre. After a week the whole stump may be fired and the residual ash will remain as a fertiliser. The nitre disseminates through the stump, and will cause it to burn readily."

[The kauri is a soft-wood tree. We cannot say whether the above process would prove effective in the case of our Queensland hardwood stumps or trees, such as ironbark, gum, and other eucalypts.—ED. "Q.A.J."]

COTTON-GROWING SCHEME FOR INDIA.

An American Journal states:—In order to develop the best qualified cotton lands to a degree sufficient to produce the fibre in the quantities proportionate to the average, Great Britain looks to India, as the best field for improvement, and the plan of development has been laid before an American firm, which is considering the undertaking.

The plan under consideration calls for the expenditure of 70,000,000 dollars, and the construction of 5,000 miles of canals; an engineering task that will consume eight or ten years to complete.

It is proposed to conduct this great irrigation undertaking in the Sind Province, near the city of Sikkur, where already a dam more than a mile long is under construction to impound the waters of the Indus, and turn them into the canal system.

The size of the undertaking may be understood, when it is to include one canal 200 miles long; another 80 miles long; one 34 miles, one 25 miles, one 40 miles, one 16 miles, and one 11 miles. These main streams will supply small canals of various lengths, which will conduct the water throughout the entire area to be devoted to cotton, so that with the favourable climate and the aid of irrigation when necessary the success of the crop would always be a certainty.

These canals, especially the large main streams, will be deep and wide enough for light craft, which will include a fleet of light-draught steamers which will transport the cotton from the presses to Sikkur, and thence to the nearest seaport, Karachi.

Answers to Correspondents.

CORN-COB GRINDING MACHINE.

G. WOLFE, Netherdale—

We have made inquiries with respect to the corn-cob grinding machines, and understand that they can be procured from Messrs. Smellie and Co. and from the International Harvester Coy., Brisbane.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MAY, 1920.

Article.		MAY.
		Prices.
Bacon	lb.	1s. 5d.
Bran	ton	£19
Broom Millet	,,	£45 to £56
Broom Millet (Sydney)	,,	£50 to £55
Butter (First Grade)	cwt.	200s. 8d.
Chaff, Lucerne	ton	£14 to £17 10s.
Chaff, Mixed	,,	£13 to £15
Chaff, Oaten	,,	£13 10s. to £17
Chaff, Wheaten	,,	£16
Chaff, Panicum	,,	£12 to £13 10s.
Cheese	lb.	1s. to 1s. 3½d.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 11d.
Hay, Lucerne	ton	£14 5s.
Hay, Oaten	,,	...
Honey	lb.	7d. to 7½d.
Maize	bush.	10s. to 11s.
Oats	,,	...
Onions	ton	...
Peanuts	lb.	6d. to 7d.
Turnips (Swede)	ton	£16 10s.
Pollard	,,	£14
Potatoes	,,	£14 to £15
Potatoes (Sweet)	,,	10s. to 10s. 3d.
Pumpkins (Cattle)	,,	£9 10s. to £10
Eggs	doz.	2s. 6d. to 3s. 11d.
Fowls	per pair	5s. to 9s.
Ducks, English	,,	4s. 6d. to 5s. 6d.
Ducks, Muscovy	,,	7s. 6d. to 9s.
Geese	,,	7s. 6d. to 10s.
Turkeys (Hens)	,,	10s. to 14s.
Turkeys (Gobblers)	,,	£1 16s. to £2.
Wheat	bush.	10s. 6d. to 11s.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	8s. to 16s.
Beetroot, per dozen bunches	9d. to 1s. 6d.
Cabbages, per dozen	2s. 6d. to 12s.
Carrots, per dozen bunches	1s. 9d. to 3s.
Cucumbers, per dozen	3d. to 1s. 9d.
Lettuce, per dozen	9d. to 1s. 6d.
Marrows, per dozen	2s. 6d. to 8s.
Peas, per sugar-bag	2s. 6d. to 16s.
Potatoes (Sweet), per sugar-bag	4s. to 8s.
Pumpkins (table), per sack	9s. 6d. to 10s. 3d.
Tomatoes, per quarter-case	3s. to 5s.
Turnips (Swede), per cwt.	16s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	MAY.
	Prices.
Bananas (Tweed River), per double-case	17s. to 18s.
Bananas (Fiji) per double-case	18s. to 22s.
Bananas (Queensland), per double-case	14s. to 20s.
Lemons (Victorian), per case	9s. to 13s.
Mandarins, per case	12s. to 15s.
Oranges (N.S.W.), per case	9s. to 12s.
Oranges (Navel), per case	14s. to 16s.
Passion Fruit (Victorian), per case	15s. to 23s.
Pineapples (Queens), per double-case	15s. to 18s.
Tomatoes (prime), per quarter-case	4s. to 10s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	7s. 6d. to 13s.
Apples, Cooking, per bushel-case	7s. to 12s.
Bananas (Cavendish), per dozen	4½d. to 1s.
Bananas (Sugar), per dozen	2d. to 10d.
Citrons, per cwt.	13s. to 15s.
Cocoanuts, per sack	£1 5s.
Custard Apples, per quarter-case	7s. 6d. to 16s.
Grapes, per lb.	..
Lemons (Lisbon), per half bushel-case	3s. 6d. to 12s.
Mandarins, per case	5s. to 15s.
Oranges, per case	5s. to 13s.
Oranges (Navel), per case	12s. to 13s.
Papaw Apples, per case	2s. to 16s.
Passion Fruit, per half bushel-case	4s. to 8s.
Peaches, per quarter-case	...
Pears, per quarter-case	12s. to 17s. 6d.
Pineapples (inferior), per case	9s.
Pineapples (Smooth), per case	5s. to 15s.
Pineapples (Ripley), per case.	...
Rosellas, per sugar-bag	4s. to 5s. 6d.
Tomatoes (prime), per quarter-case	2s. to 5s.

TOP PRICES, ENOGGERA YARDS, APRIL, 1920.

Animal.	APRIL.
	Prices.
Bullocks	£20 5s. to £26 15s.
Bullocks (Single)	...
Cows	£12 to £14 10s.
Cows (Single)	£16 5s.
Merino Wethers	37s. 3d.
Crossbred Wethers	42s. 9d.
Merino Ewes	26s. 3d.
Crossbred Ewes	47s. 6d.
Lambs	37s. 6d.
Pigs (Backfatters)	...
Pigs (Light Bacon)	...
Pigs (Porkers)	63s.

Orchard Notes for July.

THE SOUTHERN COAST DISTRICTS.

The notes for the month of June apply to July as well. The first crop of strawberries will be ripening during the month, though extra early fruit is often obtained in June, and sometimes as early as May, under especially favourable conditions. Look out for leaf-blight, and spray for same with Bordeaux mixture, also watch for the first signs of the grey mould that attacks the fruit, and spray with the sulphide of soda wash. The larvæ of the cockchafer, that eats the roots of strawberries, should be looked for, and destroyed whenever found. Pruning of citrus and other fruit trees may be continued; also, the spraying with lime and sulphur. Where the ringing borer, that either attacks the main trunk or the branches at or near where they form the head of the tree, is present, the main stems and trunks should either be painted or sprayed with the lime and sulphur wash during the month, as the mature beetles that lay the eggs that eventually turn to the borers sometimes make their appearance during the month, and unless the trees are protected by the wash they lay their eggs, which hatch out in due course and do a lot of damage. Keep the orchard clean, so that when the spring growth takes place the trees may be in good condition. There is usually a heavy winter crop of pineapples ripening during this and the following months, particularly of smooth leaves. See that any conspicuous fruits are protected by a wisp of grass, as they are injured not only by frost but by cold westerly winds.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth; as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

Where pruning of deciduous trees has not been completed, do so this month. It is not advisable to leave this work too late in the season, as the earlier the pruning is done after the sap is down the better the buds develop—both fruit buds and wood buds; thus securing a good blossoming and a good growth of wood the following spring.

Planting can be continued during the month; if possible, it should be finished this month, for though trees can be set out during August, if a dry spell comes they will suffer, when the earlier planted trees, which have had a longer time to become established, will do all right—provided, of course, that the land has been properly prepared prior to planting, and that it is kept in good order by systematic cultivation subsequent to planting.

Do not neglect to cut back hard when planting, as the failure to do so will result in a weakly growth.

As soon as the pruning is completed, the orchards should get their winter spraying with the sulphur limewash, and either with or without salt, as may be wished. See that this spraying is thoroughly carried out, and that every part of the tree is reached, as it is the main treatment during the year for San José and other scale insects, as well as being the best time to spray for all kinds of canker, bark-rot, moss, lichens, &c.

Where the orchard has not been ploughed, get this done as soon as the pruning and spraying are through, so as to have the land in good order for the spring cultivations. See that the work is well done, and remember that the best way to provide against dry spells is to keep moisture in the soil once you have got it there, and this can only be done by thorough and deep working of the soil.

When obtaining trees for planting, see that they are on good roots, and that they are free from all pests, as it is easier to prevent the introduction of pests of all sorts than to eradicate them once they have become established. Only select those varieties that are of proved merit in your district; do not plant every kind of tree that you see listed in a nurseryman's catalogue, as many of them are unsuited to our climate. The pruning of grape vines may be carried out in all parts of the tablelands other than the Stanthorpe district, where it is advisable to leave this work as long as possible, owing to the danger of spring frosts.

Where grape vines have been well started and properly pruned from year to year, this work is simple; but where the vines have become covered with long straggling spurs, and are generally very unsightly, the best plan is to cut them hard back, so as to cause them to throw out good strong shoots near the main stem. These shoots can be laid down in the place of the old wood in following seasons, and the whole bearing portion of the vine will be thus renewed.

Where vineyards have been pruned, the prunings should be gathered and burnt, and the land should receive a good ploughing.

Farm and Garden Notes for July.

FIELD.—The month of July is generally considered the best time to sow lucerne, for the reason that the growth of weeds is then practically checked, and the young lucerne plants will, therefore, not be choked by them, as would be the case if planted later on in the spring. If the ground has been properly prepared by deep ploughing, cross-ploughing, and harrowing, and an occasional shower occurs to assist germination and growth, the lucerne will thrive so well that by the time weeds once more appear it will be well able to hold its own against them. From 10 to 12 lb. of seed will be sufficient for an acre. This is also the time to prepare the land for many field crops, such as potatoes, maize, oats, and barley for green fodder; also rye, vetches, tobacco, cotton, sugar-cane, field carrots, mangolds, swedes, canaigre, &c. Early potatoes, sugar-cane, and maize may be planted in very early districts, but it is risky to plant potatoes during this month in any districts liable to late frosts or in low-lying ground. Under such conditions, it is far better to wait until well into the following month. The greatest loss in potatoes and sugar-cane has been, on more than one occasion, experienced in September, when heavy frosts occurred in low-lying districts in the Southern portion of the State. During suitable weather, rice may be sown in the North. The coffee crop should now be harvested, and yams and turmeric unearthed.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. Never walk over the land during wet weather with a view to sowing. The soil cakes and hardens, and good results cannot then be expected. This want of judgment is the usual cause of hard things being said about the seedsman. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will now want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, holly-hocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

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ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1920.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·11	5·16	6·31	5 0	6 39	5·3	6·30	5·18
2	6·14	5·15	6·32	5·0	6·40	5·4	6·29	5·19
3	6·15	5·15	6·33	4·59	6·40	5·4	6·29	5·19
4	6·15	5·14	6·33	4·59	6·40	5·4	6·28	5·20
5	6·16	5·14	6·33	4·59	6·40	5·5	6·27	5·20
6	6·17	5·13	6·34	4·59	6·40	5·5	6·27	5·21
7	6·17	5·12	6·34	4·59	6 40	5·5	6·26	5·21
8	6·18	5·12	6·34	4·59	6·40	5·6	6·25	5·22
9	6·18	5·11	6·35	4·59	6·40	5·6	6·24	5·22
10	6·19	5·10	6·35	4·59	6·40	5·6	6 23	5·23
11	6·19	5 9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·8	6·36	5·0	6·39	5·7	6·22	5·24
13	6·21	5·8	6·36	5·0	6·39	5·8	6·21	5·24
14	6·21	5·7	6·36	5·0	6·39	5·8	6·20	5·25
15	6·22	5·6	6·36	5·0	6·38	5·9	6·19	5·26
16	6·22	5·6	6·37	5·0	6·38	5·9	6·18	5·26
17	6·23	5·5	6·37	5·0	6·38	5·10	6·17	5·27
18	6·23	5·5	6·38	5·0	6·37	5·10	6·16	5·27
19	6·24	5·4	6·38	5·0	6·37	5·11	6·16	5·28
20	6·25	5·4	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·39	5·0	6·36	5·12	6·14	5·28
22	6·26	5·3	6·39	5·0	6·35	5·13	6·13	5·29
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	2·27	5·3	6·39	5·1	6·34	5·14	6·11	5·30
25	6·28	5·2	6·39	5·2	6 34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·2	6·33	5·15	6·9	5·30
27	6·29	5·2	6·39	5·2	6·33	5·15	6·8	5·31
28	6·29	5·1	6·39	5·3	6·32	5·16	6·7	5·31
29	6·30	5·1	6·39	5·3	6·32	5·16	6 6	5·32
30	6·30	5·1	6·39	5·3	6·31	5·17	6·5	5·32
31	6·31	5·1	...	...	6·31	5·17	6·4	5,33

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria).

			H. M.
3 May	○	Full Moon	11 47 a.m.
11 "	☽	Last Quarter	3 51 p.m.
18 "	●	New Moon	4 24 p.m.
25 "	☾	First Quarter	7 7 a.m.

Apogee on 7th at 6 a.m. Perigee on 19th at 4 p.m. The Moon will be totally eclipsed on the 3rd at midday, but will not be visible in Australia. It will cause a partial eclipse of the Sun on the 18th, visible in parts of Queensland about sunset.

2 June	○	Full Moon	3 18 a.m.
10 "	☽	Last Quarter	4 58 a.m.
16 "	●	New Moon	11 41 p.m.
23 "	☾	First Quarter	4 49 p.m.

Apogee on 3rd at 2·30 p.m. and on 30th at 5 p.m. Perigee on 17th at 1·12 a.m. The Moon will occult Mars and Spica on the 25th, not visible in Australia unfortunately, but on the 28th the occultation of a small star in the Scorpion about 6 p.m will be an interesting sight in small telescopes and binoculars.

1 July	○	Full Moon	6 41 p.m.
9 "	☽	Last Quarter	3 5 p.m.
16 "	●	New Moon	6 25 a.m.
23 "	☾	First Quarter	5 20 a.m.
31 "	○	Full Moon	9 19 a.m.

Perigee on 15th at 10·24 a.m. Apogee 28th, 12·24 a.m.

7 Aug.	☽	Last Quarter	10 50 p.m.
14 "	●	New Moon	1 44 p.m.
21 "	☾	First Quarter	8 52 p.m.
29 "	○	Full Moon	11 3 p.m.

Perigee on 12th at 3·48 p m. Apogee on 24th at 2·36 p.m. On the 8th and 9th of August the planets Venus and Jupiter will appear to be in juxtaposition, but will be too near to the Sun to be seen to much advantage without a telescope or binoculars. They will be about ten degrees south-east of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

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RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1920.	April, 1919.
North Coast.	In.		In.	In.
Atherton	4·34	19	4·03	5·91
Cairns	11·81	38	19·37	17·76
Cardwell	9·88	48	15·32	13·09
Cooktown	9·20	44	14·49	3·63
Herberton	4·26	33	2·63	2·61
Ingham	8·82	28	20·11	13·77
Innisfail	22·56	39	31·33	20·52
Mossman	11·68	12	25·84	17·28
Townsville	3·68	49	18·47	2·79
Central Coast.				
Ayr	2·77	33	11·30	3·85
Bowen	3·02	49	1·73	2·77
Charters Towers	1·76	38	4·68	3·81
Mackay	6·90	49	8·74	9·13
Proserpine	6·96	17	8·32	11·14
St. Lawrence	2·93	49	0·78	3·43
South Coast.				
Biggenden	1·71	21	1·42	2·26
Bundaberg	2·81	37	1·53	1·53
Brisbane	3·58	69	2·00	1·99
Childers	2·36	25	0·61	0·92
Crohamhurst	5·49	27	6·33	7·13
Esk	2·64	33	2·25	1·66
Gayndah	1·34	49	0·76	2·10
Gympie	3·10	50	1·93	3·57
Glasshouse M'tains	4·70	12	6·71	4·88
Kilkivan	2·08	41	1·28	1·35
Maryborough	3·26	49	2·41	2·49
South Coast—continued:	In.		In.	In.
Nambour	4·76	24	6·36	7·46
Nanango	1·86	38	2·17	1·38
Rockhampton	2·35	33	1·39	4·93
Woodford	4·12	33	3·78	3·27
Darling Downs.				
Dalby	1·30	50	0·34	0·84
Emu Vale	1·22	24	0·90	0·53
Jimbour	1·36	32	0·33	0·59
Miles	1·49	35	0·22	1·59
Stanthorpe	1·72	47	1·37	Nil
Toowoomba	2·51	48	1·68	1·64
Warwick	1·39	33	1·11	0·29
Maranoa.				
Roma	1·33	46	0·59	0·51
State Farms, &c.				
Bungeworgorai	1·06	6	0·56	0·25
Gatton College	1·74	21	0·51	0·26
Gindie	1·32	21	0·85	2·20
Hermitage	1·42	14	0·70	0·47
Kairi	3·95	6	5·98	5·75
Sugar Experiment Station, Mackay	5·47	23	7·28	9·52
Warren	1·53	6	0·70	2·31

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April this year, and for the same period of 1919, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Government State Meteorologist.

Pioneer River Farmers and Graziers' Show Association
Annual Show
MACKAY
Wed., 30th June, Thursday, 1st July, 1920
Special Attractions
Entries Close 10th June
Liberal Prize Money
Schedules on Application
Ralph G. Johnson, Secretary, Box 31, G.P.O., Mackay

REVISED LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

It is necessary that prompt notice be given to the Editor of changes in the Secretaryship of any Society or Association, a matter which is much neglected. Furthermore, information concerning dates on which shows are to be held must be forwarded to the Editor at least six weeks before the Show date. If these suggestions are not complied with, the Society whose Secretary neglects to supply the required information will be liable to be struck off the list of Societies published monthly in the Journal.

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1919.	1920.
Allora	Central Downs Agricultural and Horticultural Association	H. G. Deacon	28 and 29 May,	18 and 19 Feb.
Aloomba, *vid* Cairns	Aloomba Farmers' Association	George Heap		
Alton Downs	Alton Downs Farmers' Association	G. T. Crook		
Amberley	Amberley Farmers' Progress Association	J. T. Goldsborough		
Applethorpe (S. Railway)	Applethorpe Fruitgrowers' Association	L. G. Longhurst		
Atherton	Atherton Table Land Agricultural Society	W. Morris	17 and 18 Sept.	
Atherton	Atherton Agricultural, Pastoral and Industrial Society	W. C. Abbott	17 and 18 Sept.	
Ayr	Lower Burdekin Pastoral, Agricultural, and Industrial Association	C. G. M. Boyce	27 and 28 June	24 and 25 July
Ayr	United Canegrowers' Association	A. E. Dean		
Babinda	Babinda Canegrowers' Association	J. McLean		
Bald Knob	Bald Knob Branch of the Queensland Farmers' Union	F. D. Young		
Balmoral	Balmoral District Horticultural and Industrial Society	H. Marshall	30 Aug.	28 Aug.
Banyan, *vid* Cardwell	Banyan and Tully River Agricultural Association	A. J. Harman		
Barcaldine	Barcaldine Pastoral, Agricultural, and Horticultural Association	C. Lloyd Jones	29 and 30 July	
Beaudesert	Logan and Albert Agricultural and Pastoral Society	A. Winship	postponed	19 May
Beenleigh	Beenleigh Agricultural and Pastoral Society of Southern Queensland	F. W. Wuth	11 and 12 Sept.	23 and 24 Sept.
Beerburrum (Elimbah)	Beerburrum Fruitgrowers' Progress Association	A. Keers		
Beerwah	Beerwah and Coochin Creek District Farmers and Fruitgrowers' Progress Association	E. F. Jones		
Belmont	Belmont Agricultural, Horticultural, and Industrial Society	J. C. Pickering	23 Aug.	21 Aug.
Biggenden	Biggenden District Agricultural and Pastoral Society	C. J. Stephensen	26 and 27 June	24 and 26 June
Blackall	Barcoo Pastoral Society	W. P. Tilden	21 and 22 May	11 and 12 May
Blenheim, *vid* Laidley	Blenheim District Farmers' Progress Association	J. L. Dart		
Boonah	Fassifern Agricultural and Pastoral Association	G. E. Ball	14 and 15 May	12 and 13 May
Bowen	Bowen Farmers' Association	G. E. Kent	19 and 20 June	1 and 2 July
Brighton (Sandgate)	Brighton Farmers and Fruitgrowers' Progress Association	G. Buchanan		
Brisbane	National Agricultural and Industrial Association	J. Bain	Abandoned	26 to 31 July
Brisbane (Box 616, G.P.O.)	The Horticultural Society of Queensland	J. S. Hook		
Bucca (Kolan South), *vid* Bundaberg	Bucca United Farmers' Association	W. D. Moore		

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1919.	1920.
Buderim Mountain	Buderim Branch of the Queensland Farmers' Union	E. R. Nelson ...		
Buderim Mountain	Buderim Mountain Fruitgrowers' and Progress Association	A. V. Lindsay ...		
Bundaberg ...	Bundaberg Agricultural, Pastoral, and Industrial Society	Geo. Davies ...	21 to 23 May, postponed	1 to 3 June
Caboolture ...	Caboolture Pastoral, Agricultural, and Industrial Society	A. Toms	26 and 27 June, postponed and abandoned	15 and 16 July
Cairns ..	Cairns Agricultural, Pastoral, and Mining Association	Nevitt and Boden	24 and 25 Sept.	
Canaga (Chinchilla)	Canaga Pastoral and Agricultural Association	W. H. Burnett ...		
Caves (North Rockhampton)	Caves Farmers' Progress Association			
Charleville ...	Central Warrego Pastoral and Agricultural Association	L. O. Easton ...	30 Sept. and 1 Oct.	4 and 5 May
Charters Towers	The Towers Pastoral, Agricultural, and Mining Association	Geo. Urquhart ...	8 and 9 July	7 and 8 July
Charters Towers	The Towers Horticultural Society ...	Jas. H. Chappel ...	6 and 7 Aug.	18 and 19 Aug.
Childers ...	Childers Pastoral, Agricultural, and Industrial Society	John R. Wrench ...		
Childers ...	Doolbi Canegrowers' Association ...	John R. Wrench ...		
Childers ...	Isis Primary Producers and Canegrowers' Association	John R. Wrench ...		
Chinchilla ...	Chinchilla Agricultural and Pastoral Association	C. W. Lewis ...	28 May, postponed from 9 April	14 April
Clermont ...	Peak Downs Pastoral, Agricultural, and Horticultural Society	A. S. Narracott ...	4 and 5 June	
Cleveland ...	Cleveland Agricultural, Horticultural, and Industrial Society	A. L. Brown ...	...	3 July
Clifton ...	Darling Downs Pastoral, Agricultural, and Industrial Association	P. G. A. Murphy...	3 and 4 Sept., postponed to 11 Sept. and abandoned	3 and 4 March
Cooktown ...	Cook District Pastoral, Agricultural, Mining, and Industrial Association	E. A. S. Olive ...	...	July
Coolum (Maroochy River), *viâ* Yandina	Coolum Fruitgrowers' Association ...	A. E. Short ...		
Cooroy ...	Cooroy West Farmers' Progress Association	F. Basing		
Coorparoo ...	Coorparoo Progress, Horticultural, and Industrial Association	F. Wagner ...	11 Oct.	7 Aug.
Crow's Nest...	Crow's Nest Agricultural, Horticultural, and Industrial Society	Alf. Littleton ...	15 and 16 July postponed from 23 and 24 April	24 and 25 Aug.
Dalby ...	Dalby Pastoral and Agricultural Association	J. A. Hunter ...	29 and 30 April	27 and 28 April
Deeford (Dawson Valley)	Wowan-Deeford Branch of the Queensland Farmers' Union	C. J. Young ...		
Deeford ...	Don River Branch of the Queensland Farmers' Union	H. R. Brake ...		
Dirran ...	Dirran Settlers' Progress Association	Jas. Norris ...		
Doonan, *viâ* Eumundi	Doonan Ratepayers' and Farmers' Association	J. Simpson... ...		
Elimbah ...	Elimbah Farmers and Settlers' Progress Association	Chas. Rutter ...		
Elimbah ...	Elimbah Soldiers Settlers' Fruitgrowers Association	— Weigel		

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1919.	1920.
Emerald ...	Emerald Pastoral and Agricultural Society	E. Henryck ...	6 and 7 Aug., postponed from 28 and 29 May	3 and 4 June
Esk ...	Pastoral, Agricultural, and Industrial Association	T. C. Pryde ...	29 and 30 July	
Eumundi (Oakey Ck.)	Kenilworth Farmers' Association ...	Gilbert B. Sutton		
Fletcher ...	Fletcher Fruitgrowers' Association	H. E. Land ...		
Gatton ...	Lockyer Agricultural and Industrial Society	...	10 and 11 July	
Gayndah ...	Pastoral, Industrial, Agricultural, and Horticultural Association	E. M. Stephensen	1, 2, and 3 July, postponed to 16 and 18 Sept.	29 and 30 June and 1 July
Gin Gin ...	Gin Gin Agricultural, Pastoral, and Industrial Society	C. M. Morris ... Ploughing Match	28 and 29 May, postponed to 11 and 12 June	2 and 4 June
Gladstone ...	Port Curtis Agricultural, Pastoral, and Mining Association	J. T. W. Brown ...	26 and 27 June, postponed	25 and 26 May
Goomboorian	Goomboorian Branch of the Queensland Farmers' Union	M. Webster ...		
Goombungee	Goombungee Agricultural, Pastoral, and Horticultural Society	E. J. Moore ...	13 March, postponed to 17 April and abandoned	
Goondiwindi	MacIntyre Pastoral and Agricultural Society	J. S. Hall	13 and 15 May, postponed	11 and 12 May
Grantham (Lune Valley)	Ma Ma Creek Farmers' Union ...	Edwin Wilson ...		
Gympie ...	Gympie and District Fruitgrowers' Association	H. Sedgman ...	27 and 28 Aug.	
Gympie ...	Gympie Agricultural, Mining, and Pastoral Society	F. W. Shepherd ...	12 and 13 Nov.	1 and 2 Sept.
Herbert River	Ripple Creek Farmers' Association...	Geo. Geeson ...		
Herberton ...	Herberton Mining, Pastoral, and Agricultural Association	E. C. Wright ...	21 and 22 April	5 and 6 April
Highlands ...	Highlands Branch of the Queensland Farmers' Union	Alf. P. Wynne ...		
Hughenden...	North Western Queensland Pastoral and Agricultural Association	H. P. Blackall ...	20 and 21 May	1 and 2 June
Ingham ...	Herbert River Pastoral and Agricultural Association	J. W. Cartwright	12 and 13 Sept.	
Inglewood ...	Inglewood Agricultural, Pastoral, and Horticultural Society	J. F. Cheshire ...		
Inkerman	Inkerman Farmers and Graziers' Association	E. F. Ryan ...		
Innisfail ...	Johnstone River Agricultural Society	J. Nisbet	3 & 4 Oct.	
Ipswich ...	Ipswich Horticultural Society ...	S. H. Macartney W. S. Johnston	21 and 22 May	
Ipswich ...	Ipswich Queensland Pastoral and Agricultural Society	G. W. Allen ...	21 and 22 May	28 and 29 May
Ithaca ...	Agricultural and Industrial Association	T. A. Bennion ...	26 April	24 April
Kamma (Cairns)	The Cairns Canegrowers' Association	C. V. Hives ...		
Kandanga ...	Mary Valley Agricultural, Horticultural, and Industrial Society	G. A. Ellis	3 and 4 Sept.	
Kilcoy ...	Kilcoy Pastoral, Agricultural, and Industrial Society	A. R. Hooper ...	17 and 18 July, postponed from 4 and 5 June	1 and 2 July
Kilkivan ...	Kilkivan Agricultural, Pastoral, and Industrial Society	Jones Bros. ...	postponed	26 and 27 May.

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1919.	1920.
Killarney	Killarney Agricultural Society	...	26 and 27 Feb., postponed	
Kingaroy	Agricultural, Pastoral, and Industrial Society	E. T. Ambrose	6 and 8 May	4 to 6 May
Kin Kin	Kin Kin Branch of the Queensland Farmers' Union	A. M. Gourgand		
Kolan River South, *viâ* Bundaberg	United Farmers' Association, Bucca	W. D. Moore		
Koondai-i (Bell)	Koondai-i Dairymen's Association	Jas. Johnston		
Laidley	Lockyer Agricultural and Industrial Society	...	10 and 11 July	
Landsborough	Bald Knob Branch of the Queensland Farmers' Union	F. D. Young		
Lawson, *viâ* Wondai	Lawson Progress Association	J. Power		
Lockyer	Agricultural and Industrial Society	F. Berkman	10 and 11 Sept., postponed from 10 & 11 July	25 and 26 Aug.
Longreach	Longreach Pastoral and Agricultural Society	F. C. Longworth	6 and 7 May	
Lowood	Lowood and Tarampa Pastoral and Agricultural Association	Otto T. Sakrzewski	13 and 14 June, postponed from 23 & 24 April	25 and 26 May
Mackay	The Pioneer River Farmers and Graziers' Show Association	R. G. Johnson	25 and 26 June, postponed	30 June and 1 July
Mackay	The Homebush Canegrowers' Association	Emil Fox		
Mackay	The Oakenden Canegrowers' Association	James R. Waters		
Mackay	The Farleigh Canegrowers' Association (Richmond Branch)	Charles A. L. Denman		
Mackay	The Racecourse Canegrowers' Association	T. Walker		
Mackay	The Pleystowe Canegrowers' Association	E. Harrison		
Macnade, *viâ* Lucinda	Macnade Farmers' Association	G. Geeson		
Malanda	Millaa Millaa Settlers' Progress Association	S. S. Buckley	10 and 11 Sept.	
Malanda	Eacham Pastoral, Agricultural, and Industrial Society	D. Brown	10 and 11 Sept.	27 and 28 Oct.
Mapleton	Mapleton Fruitgrowers and Farmers' Progress Association	D. H. Story		
Manly	Manly Fruitgrowers' Mutual Benefit Association	J. Alcorn		
Marburg	Marburg and District Agricultural and Industrial Association	F. H. Bielefeld	2 and 3 June	1 and 3 June
Mareeba	Mareeba and District Mining, Pastoral, Agricultural, and Industrial Association	Geo. H. O'Donnell		
Maroochy	Maroochy River Branch of the Queensland Farmers' Union	F. T. Latten		
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	H. A. Jones	9, 10, and 11 June	8, 9, and 10 June
Minehan's Siding, *viâ* Townsville	Houghton River Farmers' Association	R. Walton		
Millaa Millaa	Agricultural Society	Harvey Jurd		
Millaa Millaa, *viâ* Cairns	Millaa Millaa Settlers' Progress Association	T. W. Hanley		
Mitchell	Maranoa Pastoral, Agricultural, and Industrial Association	Neil Hammond	20 and 21 May	11 and 12 May
Montville	Montville Fruitgrowers and Farmers' Progress Association	T. H. Brown		
Mooloolah	Mooloolah and Glenview Branch of the Queensland Farmers' Union	J. Sapp		

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1919.	1920.
Mount Gravatt	Mount Gravatt and District Agricultural, Horticultural, and Industrial Society	A. J. Trim... ...	26 July	24 July
Mount Larcom, *viâ* Gladstone	Wilmott Farmers' Progress Association	J. J. Kelly... ...		
Mount Morgan	The Mount Morgan Poultry and Kennel Club	Geo. Howard ...	5 and 6 June	
Mundubbera	Boynewood and Derra Farmers and Settlers' Progress Association	Alfred Faint ...		
Mundubbera	Mundubbera Agricultural, Pastoral, and Industrial Association	R. Lahey	4 Sept., postponed from 26 & 27 June	7 July
Murgon ...	Murgon Branch of the Queensland Farmers' Union	F. Gustafson ...		
Nambour ...	Maroochy Pastoral, Agricultural, Horticultural, and Industrial Society	J. J. Wilkinson ...	10 and 11 July postponed	29 and 30 April
Nanango ...	Nanango Agricultural, Pastoral, and Mining Society	Miss Lee	30 April and 1 May	12 and 13 May
Nerang ...	Southern Queensland and Border Agricultural and Pastoral Association	E. Fass		
Noosa ...	Noosa Agricultural, Horticultural, and Industrial Society	D. J. L. Hartley ...		
North Pine ...	The Pine Rivers Agricultural, Horticultural, and Industrial Association (at Lawnton)	G. W. Armstrong ...	13 and 14 June	
Oakey ...	Oakey Agricultural and Pastoral Society	H. M. Rutledge ...	8 Oct.	26 March
Oakey Creek, *viâ* Eumundi	Kenilworth Farmers' Association ...	A. Hughes		
Orallo ...	The Orallo Branch of the Queensland Farmers' Union	E. A. Thomas ...		
Palmwoods ...	Palmwoods Fruitgrowers' Association	W. Browne ...		
Philpott Creek	Philpott Creek Farmers' Society ...	H. J. Brown ...		
Philpott Creek	Mundouran Pocket Farmers' Association	A. J. C. Mathieson		
Pine Rivers ...	Agricultural, Horticultural, and Industrial Association	Geo. Armstrong ...	13 and 14 June, postponed to 8 and 9 Aug.	
Pittsworth ...	Pittsworth Pastoral, Agricultural, and Horticultural Association	L. G. Sims ...	11 Sept.	15 April
Pomona ...	Noosa Agricultural, Horticultural, and Industrial Society	D. J. Hartley ...	6 and 7 Nov.	
Proserpine ...	Proserpine Agricultural, Pastoral, and Industrial Association	M. A. Mackenzie ..		
Proserpine ...	Proserpine Farmers and Canegrowers' Association	M. A. Mackenzie ...		
Proston ...	Proston Progress and Farmers' Association	T. M. Stephenson		
Ravenshoe ...	Ravenshoe Farmers and Graziers' Progress Association	W. R. Soilleux ...		
Rockhampton	Rockhampton Agricultural Society...	H. Hill	24, 25 and 26 July, postponed from 19 & 21 June	17 and 19 June
Rocklea ...	Rocklea Agricultural and Industrial Association	Mrs. A. Abercrombie	27 Sept.	25 Sept.
Roma ...	Western Pastoral and Agricultural Association of Queensland	F. W. Mills ...	13 and 14 May	18 and 19 May
Rosewood ...	Rosewood Agricultural and Horticultural Association	A. J. Loveday ...	5 & 6 Sept., postponed from 2 and 3 May	7 and 8 May
Sarina ...	Sarina Branch of the Pioneer River Farmers and Graziers' Association	W. S. O'Grady ...		
Sarina ...	The Plane Creek Canegrowers' Association (Mackay)	P. Olsen		
Sherwood ...	Sherwood Progress Association ...	E. Le. Breten ...		

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1919.	1920
Southport ...	Agricultural, Horticultural, and Industrial Society	E. Fass		8 Oct.
Springsure ...	Springsure Pastoral and Agricultural Society	A. J. Lewis ...	Show abandoned	19 and 20 May
St. George ...	Balonne Pastoral and Agricultural Association	Mark Roberts ...		
Stanthorpe ...	Stanthorpe Agricultural Society ...	A. E. Bateman ...	5 to 7 Feb.	4 to 6 Feb.
Stanwell ...	The Stuart's Creek Farmers' Progress Association	W. H. Teakel ...		
Summit, S. Railway Line	The Summit Fruitgrowers' and Progress Association	B. Teale		
Takura, *viâ* Maryboro'	Takura Primary Producers' Union	H. J. E. Tooth ...		
Taroom ...	Taroom Agricultural and Pastoral Association	...	13 and 14 May	
The Gums, *viâ* Tara	The Gums and Horse Creek Pastoral and Agricultural Association	R. A. Markham ...		
Toogoolawah	Toogoolawah Pastoral, Agricultural, and Industrial Association	E. F. Young ...	5 and 6 June, postponed from 5 and 6 May	4 to 6 May
Toombul ...	Toombul Agricultural, Horticultural, and Industrial Association	W. D. McCart ...	6 and 7 Sept.	1 and 2 Oct.
Toowoomba...	Royal Agricultural Society of Queensland	G. Noble	6 and 8 May	20 to 22 April
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association	J. N. Parkes ...	2 and 3 July	14 and 15 July
Wallumbilla	Agricultural and Pastoral Association	Frank C. Hawes ...		25 and 26 May
Warwick ...	Eastern Downs Horticultural and Agricultural Association	H. Sterne	13 and 14 May, postponed to 10, 11, & 12 Feb., 1920	10 to 12 Feb.
Wellington Point	Wellington Point Agricultural, Horticultural, and Industrial Association	Jno. Burge ...	...	31 July
Wolvi, *viâ* Gympie	Wolvi Farmers' Progress Association	W. F. P. Asher ...		
Wondai ...	Wondai Agricultural, Pastoral, and Industrial Society	H. J. Compagnoni	10 and 11 Sept., postponed from 16 and 17 July	19 and 20 May
Wondalli ...	Wondalli Branch of the Queensland Farmers' Union	C. R. Cameron ...		
Woodford ...	Woodford District Fruitgrowers' Association	H. C. Cowie ...	3 and 4 July	
Woodford ...	Agricultural, Pastoral, and Industrial Association	A. Hendy	9 and 10 Oct., postponed from 3 and 4 July	8 and 9 July
Woolooga ...	Woolooga and District Farmers' Progress Association	J. J. Platt		
Woombye ...	North Coast Agricultural and Horticultural Society	E. E. McNall ...	11 and 12 June, postponed	
Woongarra, *viâ* Bundaberg	The Woongarra Canegrowers' Association (A.S.P.A. Branch)	R. O. Strathdee ...		
Yandina ...	Cooloolabin Farmers and Fruitgrowers' Association	A. Drummond ...		
Yandina Creek *viâ* North Arm, N.C. Line	Yandina Creek Farmers and Settlers' Progress Association	J. J. Simpson ...		
Zillmere ...	Zillmere Agricultural, Horticultural, and Industrial Society	A. B. Marquis ...		

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